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Superintendents Meet At Cincinnati, Ohio

A. B. C. Drew of New Bedford, Mass., Is Chosen President For Ensuing Year—Poland Springs, Me., Is Selected As Meeting Place of 1941 National Convention—Many Interesting Papers Presented.

CINCINNATI, Ohio, June 24, 1940—The Twenty-first Annual Convention of the American Pulp and Paper Mill Superintendents Association was held at the Netherland Plaza Hotel, Cincinnati, Ohio June 18-19-20, 1940.

Although the first meetings were scheduled for Tuesday, there were many arrivals on Monday and the Trustees were in session all day. Poland Springs, Maine was selected for the 1941 Convention. At the exhibitors dinner which was held Monday night Carlo Vicario who was chairman said the function of the committee was to establish a close contact between the association and the manufacturers exhibiting. H. H. Harrison president of the superintendents association explained the new plan for Allied Industrial Affiliates of the American Pulp and Paper Mill Superintendents Association which should make for closer cooperation between the allied industry and the Association.

At 11:00 A.M. Tuesday morning president H. H. Harrison called the convention to order. The invocation was delivered by Rev. Dennis Burns S. J. president of Xavier University, Cincinnati.

Names of the members who have passed away in the past year were read by R. L. Eminger secretary of the Association. Mayor James Garfield Stewart of Cincinnati, Ohio delivered the address of welcome and A. B. C. Drew first vice president responded.

A. B. C. DREW
President

The President's Address

H. H. Harrison, the president of the association presented his address as follows:—

The forces of hate and violence have again disorganized our lives. The catastrophe which has overtaken Europe threatens us. Some of our members are from the United States, others are from Canada where men are leaving their jobs in the paper mills and going out to face the unknown. Those left behind are doing their best to carry on. Some of these same men had planned to be here with us today. In these days of rapidly moving destiny, there is but one course open to us all and that is to do our duty whatever and wherever it may be.

If our duty continues to be to run the mills, we have changing conditions to face. We must adapt ourselves to the materials we have. If at times it seems as if we could not maintain standards we have set in the past, we should remember that improvement only comes through struggle and some lasting good may develop out of present difficulties. Necessity often forces

us to outdo ourselves. Obstacles are the stepping stones a courageous man uses to build the stairway to success.

If there is a shortage of certain kinds of pulp or dyes or chemicals the American pulp and paper industry has the resources and ingenuity to cope with the situation. Whatever we can do to maintain the usual habits of living of the people will have a tendency to calm useless hysteria.

Export Orders Increase

One of the effects of the war has been to increase the number of export orders. We have much to learn about conditions in those countries in order to make a good delivery. We should bear in mind that every such order is a diplomatic mission from our country to that foreign land. To send anything but our best just because it is out of the country and cannot be returned does not increase the friendship of the delivery recipient toward the people of the country which made the delivery. Repeat business should be as eagerly sought in export as in domestic markets.

The effect of the war upon some of the economic experiments undertaken during the past few years may be profound. The acid test of reality will etch away what has been bad and will disclose the worthwhile features which should be retained. Thomas Edison once said "If you want to get results—experiment, and nature talks to you." But when experience proves a thing to have been a mistake we should not embarrass ourselves by trying to maintain an error.

Costs of raw materials are going up. Costs of machine clothing are rising. Taxes for re-armament added to other taxes increase our conversion costs. Increased selling prices will reach a point where volume of demand will decrease. The superintendent must be alert to every possible efficiency which will permit a large volume of goods at a price the public can pay. It is in associations such as ours that he can keep abreast of developments. We need not fear the Anti-Trust laws, there can be no monopoly of knowledge.

The pooled experience of the industry brings progress at a tremendous rate. I have heard it said that obsolence is occurring today in the paper industry almost as fast as in the automobile and radio industries.

OSCAR STAMETS
First Vice President

GROVER KEETH
Second Vice President

So far, progress seems to take the form of perfecting existing types of equipment and materials rather than radical new developments.

Milestones of Progress

With this 21st convention our association attains its majority. It is appropriate to note a few mile stones of its progress.

The first meeting to organize the association was held in the City Hall, Appleton, Wis., June 3, and 4, 1919. Fred C. Boyce who was temporary chairman of the first meeting served until 1922 as president of the association. Peter J. Massey was secretary-treasurer. From the very beginning the plan called for the organization of geographical divisions. One month after the above meeting, the Michigan Division was organized at Kalamazoo and the following month the Northwestern Division was organized. The Miami Valley Division was the third to organize. The following year the Northeastern and the Northern New York Divisions came in. Then at two year intervals the Connecticut Valley, the Southern and the Penn-New Jersey followed. More recently in 1933 the Pacific Coast organized a division.

In 1928 a grant of $2,500 was made to the University of Maine for use in work of the Pulp and Paper Mill School. In 1931 a donation of $1,000 was made to the Building Fund of the Institute of Paper Chemistry at Appleton.

In April 1932 the American Pulp and Paper Mill Superintendents Association, a Non-profit making enterprise, was incorporated under the laws of the State of Ohio. The purpose for which we incorporated were to discuss matters of mutual interest to our members, without conflicting with established policies of the mills; to assist in the solution of problems confronting the paper industry; to encourage social relations among our members; and to organize various local divisions of the corporation so that its members may derive the benefits of periodical discussion relative to the problems of their section of the country.

Association Has 809 Members

Membership in our organization is limited to men who are engaged actively in the manufacture and conversion of pulp, paper products and power plants in connection with mills, also certain others in mills

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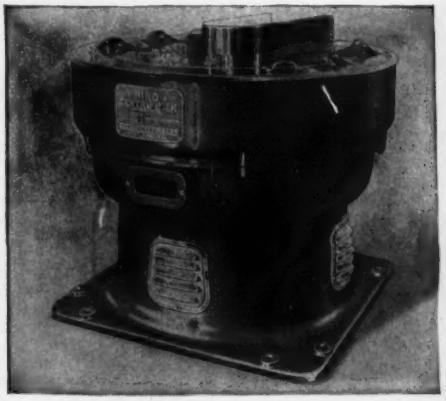

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whose duties are of an active and supervisory nature. Even with such restrictions our membership has grown to 809 key men of the industry. We are a tax free corporation yet in spite of that, last year we paid in taxes of one kind or another an amount equal to 60 cents a member.

It has been both an honor and an education to have served as president of your organization during the past year. The loyal and efficient service of Bob Eminger and George Craigie have made your association function smoothly. No one who has not been intimately concerned with the operation of our organization can realize the specialized knowledge which each of these men possesses in his own particular field. The experience of each succeeding year increases their value to the association I here and now want to express my sincere appreciation for the help I have received from each of them.

Bob Eminger has done such excellent work with the Year Book over such a long period that I am afraid some of us take it for granted. The only way that the association can afford to publish the transactions of the convention bound in one book is by the advertising that is sold in our Year Book. A written record of what was said at the meetings is at times, of tremendous value. Those advertisers make it possible for us to preserve the most valuable part of the convention until the times when we need it. There is only one way to really thank an advertiser.

Owes Debt to Finance Committee

The organization owes a debt to the members of the finance committee. In February I appointed them as budget committee so that all of the plans for the raising of funds, the conservation of our resources and the proposed disbursement of funds should be in the hands of one committee. Through the years they have given considerable time and thought to their duties with great benefit to our economic condition.

I wish to thank the *Paper Mill and Wood Pulp News*, the official organ of our Association for the help and publicity which they have given our organization. To the members of its staff as individuals I owe thanks for helpful suggestions which were the products of their long experience.

L. S. McCurdy
Third Vice President

S. G. Blankinship
Fourth Vice President

The other trade papers have given us valuable space in their columns and advertising space for which we as an association should thank them.

The Superintendents Association is an affiliate member of the American Paper and Pulp Association. The relations with that organization during the past year have been most cordial. We are going to have the privilege of hearing E. W. Tinker, the new executive secretary of A.P.P.A. at noon on Thursday. The Salesmens Association and the Technical Association are also affiliate members. Both organizations have been most gracious and your president has been invited as your representative to attend their convention meetings. We have in turn reciprocated by inviting their presidents to be present here.

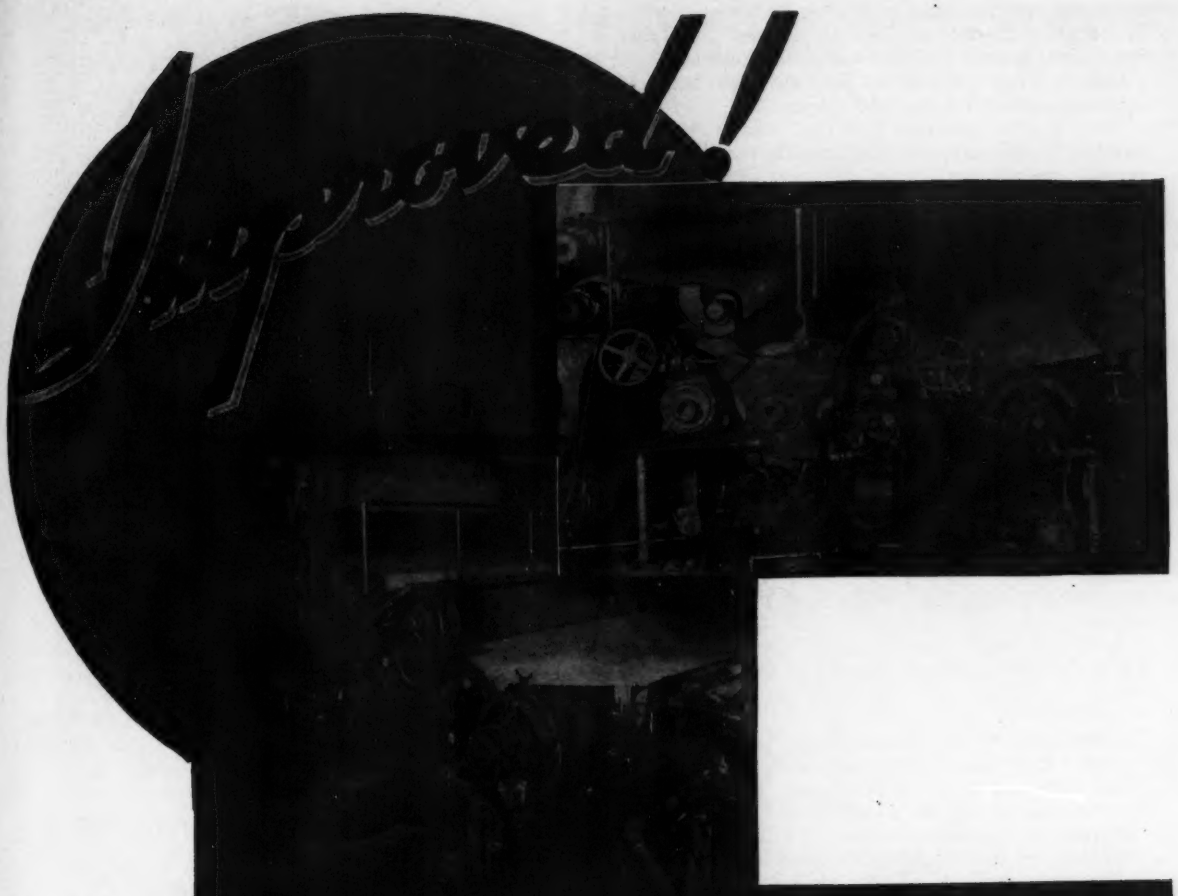
Another group whom I must thank are those busy men who have given their time to come here to share their knowledge by delivering addresses or preparing papers. Some of them have gone to great effort to be with us and we should in return give attentive hearing to their messages.

During the past year we have received helpful advice from the National Association of Manufacturers. I believe that more cooperation can be developed between that organization and ourselves and I recommend to my successor to investigate this matter and determine what can be done.

Thanks to Exhibitors Committee

I want to thank the Exhibitors Committee of the Paper Industry for the very real aid which they have given us in making our plans and developing the exhibition. Working with George Craigie, they have been responsible for the success of this activity. There are some who feel that the exhibition carried around to different sections of the country is one of the most educational features of our Annual Meeting. We are experimenting this year by making a determined effort to get the men in the ranks to come to the Exhibition. In the years to come, these will be the men who will be the superintendents and run the mills.

The National organization owes its gratitude to the divisional officers who are the most active contact with the individual members. They have the task of finding suitable programs and making arrangements. These chairmen together with the national officers



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make up the governing body, the Board of Trustees and are the life blood of the association. The meetings this past year have been of the highest character. I believe every division has been visited at least once by some one of the National officers.

The group chairmen of this convention have worked loyally and effectively. Their efforts make possible the intimate informal groups of people interested in the same things and provide opportunities that are lost when an organization grows big and has to adopt the forum type of meeting.

I have tried to give credit to all those who have worked with us during the past year. It is an imposing list. I am proud of the fact because it proves that in the cooperative effort of all these people we have an organization typical of democracy and operated in The American Way.

F. L. Zellers Presides

The meeting then adjourned for lunch. F. L. Sellers, French Paper Company, Niles Mich., as toastmaster introduced the speaker from the U. S. Secret Service who talked on Know Your Money with Motion Pictures.

General Conference

In the afternoon a general conference was held at which President H. H. Harrison presided and at which the following informative papers were presented:

"Paper Behavior in the Mill"—V. L. Shaw, president, Perfecting Service Corporation, Chicago, Ill.

"The Equipment for Storage and Distribution of Liquid Alum in the Paper Mill"—E. V. White, consulting engineer, Cincinnati, Ohio.

"Surface Active Chemicals: Their Behavior and Practical Application"—Dr. J. H. Shipp, head of fine chemicals research, E. I. du Pont de Nemours & Co., Wilmington, Del.

Group Meetings

Tuesday evening a boat trip on Steamer Island Queen to Coney Island park was enjoyed by all.

Wednesday morning the group meetings were held as follows:

R. L. Eminger
Secretary-Treasurer

Raymond S. Barton
Fifth Vice President

Board

Chairman—H. F. Bennett, the Gardner Richardson Company, Lockland, Ohio.

"What Has Brought about the Recent Interest in Bacteria in Board?"—Harry C. Fisher, The Gardner Richardson Company, Lockland, Ohio.

"Effects of Proper Humidity with Regard to Printing and Scoring of Board"—Walter E. Sooy, The Gardner Richardson Company, Middletown, Ohio.

Chemical Pulp

Chairman—Luther C. H. Beighey, Hammermill Paper Company, Erie, Pa.

"Importance of pH and Catalysts in Bleachery Operations"—John D. Rue, Hooker Electro-chemical Company, Niagara Falls, N. Y.

"Chipper Knives"—C. P. Robinson, Heppenstall Co., Pittsburgh, Pa.

"The Use of Stainless Steel Alloys in the Manufacture of Sulphite Pulp"—G. C. Kiefer, Allegheny Ludlum Steel Corporation, Breckenridge, Pa.

"Multiple Knife Chippers"—N. P. Wardwell, Carthage Machine Company, Carthage, N. Y.

Coated Papers

Chairman—Edward T. A. Coughlin, Bryant Paper Co., Kalamazoo, Mich.

"Carbonate in Coated Papers"—H. F. Roderick, Technical Director, Michigan Alkali Co., Wyandotte, Mich.

"Facts about Coating"—Frank W. Egan, John Waldron Company, New Brunswick, N. J.

"Dry Blending and Mixing of Materials"—E. M. Rupp, National Engineering Company, Chicago, Ill.

Fine Papers

Chairman—O. P. Gephart, Miamisburg Paper Company, Miamisburg, Ohio, also Chairman of the Miami Valley Division, will preside.

"The More Recent Developments of Printing Fine Papers"—Ronald I. Drake, Champion Paper and Fibre Company, Hamilton, Ohio. This will lead up to a round-table discussion of the subject.

Finishing, Storing, and Shipping

Chairman—William J. Reigers, Beckett Paper Company, Hamilton, Ohio.

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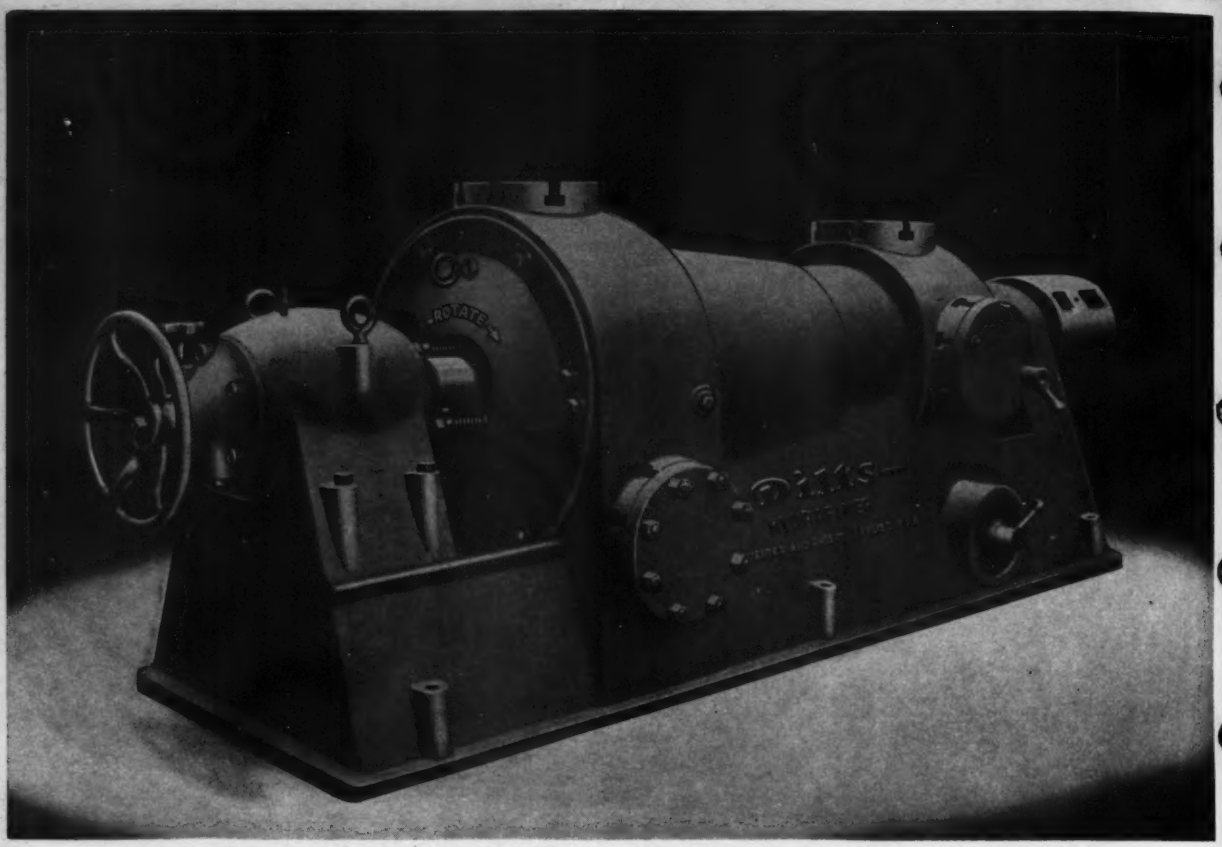

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The great developments in the field of stock preparation are based on a more scientific knowledge of fibre treatment and the designing and building of equipment to turn this knowledge into practical, economical production. The Dilts Hydrafiner enjoys a foremost position in the paper industry because of its high speed, low-cost preparation of uniformly fine quality stock.

This compact, precision built unit utilizes the principle of close clearances and high surface speed for producing the scientifically and accurately controlled refining action. Its efficiency and economical operation is proof of the skillful designing and engineering for which all Dilts equipment is noted. The great flexibility of the Hydrafiner permits its use as an adjunct to, or as a definite part of, your present equipment in continuous or batch operation.

The Hydrafiner and all other Dilts stock preparation equipment are built with a background of more than 70 years' experience in the paper-making industry—an experience which assures the ultimate in practical, dependable service.

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These chests are equipped with propeller type agitators and designed to assure steady, uniform movement of stock.

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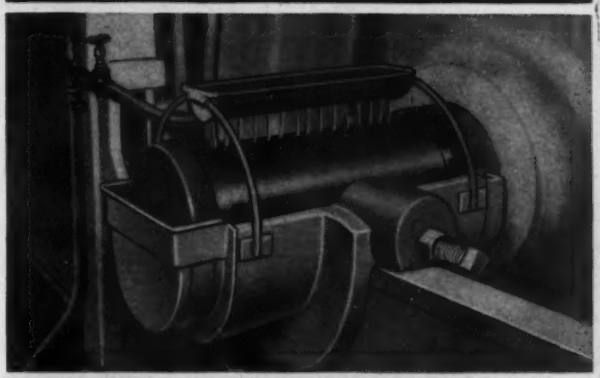
The Dilts outside operated Dump Valve is especially designed to prevent plugging.

Simple in construction and manually operated, the speed of dumping is under positive control at all times. Dilts quality throughout.

WATER LUBRICATED BEATER BEARING

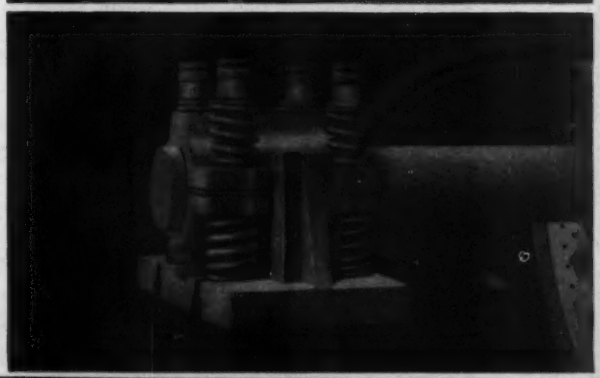
These bearings assure savings in oil, power, and time. They give positive lubrication and reduce operating costs, at the same time they make for cleanliness not found with other types of bearings.

This is another of the many units in the complete line of Dilts stock preparation equipment and replacement parts.



DOUBLE SUSPENSION SPRING BEARINGS

This is ideal equipment for use on breaker beater rolls. The heavy cast steel bearings are supported above and below in heavy duty car-type springs which absorb both upward and downward shock. Both halves of the bearings are babbitted and the lower half is chambered for water cooling. Dilts Double Suspension Spring Bearings can be furnished in either plain or marine thrust type.



Dilts

PICTURE TAKEN AT THE BANQUET HELD AT THE TWENTY-FIRST ANNUAL CONVENTION OF THE AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, NETHERLAND PLAZA HOTEL, CINCINNATI, OHIO, THURSDAY EVENING, JUNE 20, 1940.

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Other uses for RCI synthetic resins in the paper industry include: clearer, paler overprint varnishes and lacquers and more efficient heat seal and wax coatings.

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"Air Conditioning of Finishing Room from a Practical Angle"—J. Linville Mullin, Hopper Paper Company, Taylorville, Ill.
"Paper Sorting Machine"—W. S. Read, Dexter Folder Company, Pearl River, N. Y.
"Handling of Paper Broke"—Discussion.

NEWSPRINT AND WRAPPING

Chairman—R. W. Haddock, Escanaba Paper Company, Escanaba, Mich.
"Manufacture of Newsprint on High Speed Machines"—H. C. Cram, Appleton, Wis.
"Automatic pH Control at the Machine"—A. L. Chaplin, Leeds and Northrup Company, Philadelphia, Pa.

PLANT AND POWER ENGINEERS

Chairman—Merton S. Fogerty, Michigan Paper Company, Plainwell, Mich.
"Boiler and Paper Machine Controls"—Alfred Wenzel, Republic Flow Meters Company, Chicago, Ill.
Film—"Furnace Operation of Boilers"—Otto D. Lorenzi, Combustion Engineering Company, New York, N. Y.

TISSUE

President Howard Harrison was host and Walter Johnson of Hoberg Paper Mills served as discussion leader. There was a trip through the Crystal Tissue Company, Middletown, Ohio and discussion was held in the meeting room of the mill office.

Golf, skeet shooting also a trip through Proctor & Gamble factory were choice for Wednesday afternoon.

A joint dinner with special entertainment was enjoyed by all in the Pavillon Caprice H. H. Harrison, president was toastmaster. Prizes were presented for golf and skeet shooting.

E. W. Tinker Speaks

Thursday morning was reserved for visiting the exhibits followed by a luncheon with William Beckett, treasurer of the Beckett Paper Company toastmaster who introduced E. W. Tinker executive secretary of American Paper & Pulp Association.

Mr. Tinker spoke as follows on "The Paper and Pulp Industry and National Economy":—

Recent world events and our national reactions to these events are of peculiar significance to the paper and pulp industry. Although the industry has always been susceptible to world conditions, probably never before has it been more vulnerable to such conditions than it is today. The fact that paper and pulp forms such a substantial portion of world trade and particularly of the trade of the United States as an importer of pulp and newsprint paper, makes our position uncertain in view of the European war and it is possible political developments. These developments will inevitably leave an indelible impression on the industry with respect to its growth, price structure, employment conditions and manufacturing trends. Many paper mills, hitherto dependent to a greater or lesser extent upon foreign grades of pulp, may in the near future, of necessity, use grades domestically produced. This would require ingenuity in manufacture and possibly some shifting in established sales and trade customers. Furthermore, the tendency to provide new installations to meet emergency conditions may accentuate the already acute competitive situation within the industry itself.

A Matter of Grave Concern

What the future holds in post-war days is a matter of grave concern; concern not only to executives in the industry but to all those who make their livelihood as a part of the industry. The possibility that with the conclusion of the war, conditions will be created in foreign countries in which extremely low wage scales will prevail and a vast post-war struggle for economic supremacy develop, will require formulation of new domestic policies and a rapid shifting of conditions in the American industry to meet foreign competition. Even now such new policy is being formulated. Clear thinking and clear foresight at this time are essential if we are not to undergo a tremendous economic disruption with extremely unfortunate conclusions, not only from a profit and loss standpoint but, more important, from the standpoint of the employment of people within the industry.

The paper and pulp industry has made an enviable record in the stability of employment which it has given to labor. Any disruption of this enviable record must be avoided. However, this will require real understanding not only within the industry itself but on the part of public officials and in fact the public itself. I have little doubt but that we can meet the post-war period successfully but cooperation and understanding are essential if we are to do so. As I conceive it, this is a matter concerning which the American Paper and Pulp Association should establish definite policies and develop definite objectives.

Pulp Available to the Industry

Of more immediate concern is the situation with regard to pulp supplies and more particularly of the grades of pulp available to the industry. The situation is critical and promises to become more so. Beyond this is the possibility that in the development of our national defense plans, so essential to national security, the industry will be materially affected in the general mobilization and planning that is taking place. If plans for national defense involve the planned allocation of skilled labor and of essential raw materials, and the development of a national plan regimenting industry, the effect upon the paper and pulp industry will be far-reaching. In my opinion it is of vital importance that all of us be currently and correctly informed not only as to the immediate facts but as to the likely trends if we are to protect our company and industry position in the future picture.

While you and I may or may not agree, we must recognize that there has been and still is a tremendous drift in the tide of industrial affairs towards control by the Federal Government. More and more the long arm of Uncle Sam is felt as this centralization takes place and more and more the trends in the government policy should concern industry. This is a fact and must be recognized as such. It is not a matter of individual opinion or individual desire. I would like to illustrate this particular point by citing some recent instances with which the American Paper and Pulp Association has been concerned.

An Impressive Reaction

In March an Industry Committee was appointed by Federal authority under the provisions of the Wage and Hour Act, looking to the establishment of a new minimum wage in the industry. This committee, with equal representation from labor, the public, and the employers, reviewed the situation and disagreed. Sub-

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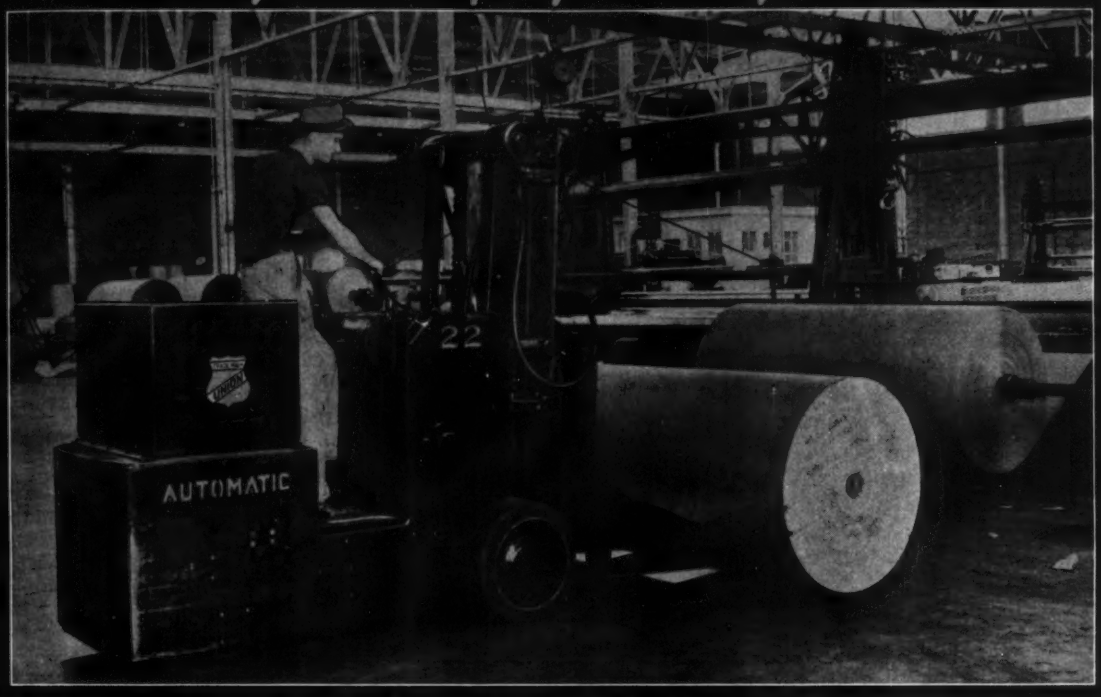

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sequently, additional hearings were held and a final opportunity was granted on June 12 for the industry to present its case. To me one of the most interesting and impressive reactions was that of the six employer representatives appointed by the Government on the Industry Committee. With one exception these individuals represented mills paying well over the highest minimum wage that could be established in the industry. However, these six representatives unanimously stood in favor of a graduated increase rather than a sudden increase, in order to permit smaller and possibly less substantial mills to adjust themselves. This action was taken even though such mills were on a competitive basis. On June 20 hearings will start in the matter of establishing a minimum wage for all converters, and probably by the first of the year the Wage and Hour Administrator will have established a new base rate for the entire paper industry.

Waste Disposal

In other fields of activity legislation is pending in the Congress regarding waste disposal. The conceptions and proposals of fanatical proponents, if carried into legislation, might render economically unsound many individual mill operations and would in the end add to our unemployment burden. Also, of great concern to the industry, are the various proposals made to Congressional committees that would materially affect the cost of wood used by the industry. Here again, lack of realization of the facts in the situation and the trend to be extremely critical of industrial effort rather than helpful will have a material bearing on the conclusions. Illustrative of the breadth of government interest in the current industrial problems in the paper industry are the different proposals to carry beyond reasonable and satisfactory limits the matter of sanitation in the paper used in both dry and wet packaging of food.

Coordinated Effort Needed

These are a few of the problems of concern to the welfare of the industry as a whole and to every individual employed in the manufacture or sale of paper. Only through properly coordinated effort and through understanding of the common problems can we be assured of non-injurious conclusions. I have given much consideration to the program and objectives of the American Paper and Pulp Association. I appreciate that as a rule the things that are of concern to all receive the least individual attention. It has, therefore, been a most pleasant experience to find an industry characterized by individual action and yet giving real consideration not only to individual welfare but to the welfare of the industry as a whole and, indirectly, to the public.

The paper and pulp industry is one of the major industries of the United States. Its record as an employer of labor and a contributor to the highest standards of living on the part of the people of the United States will compare favorably with any industry. The fact that it has never dramatized its efforts does not detract from the merits of what it has accomplished. It seems to me inevitable that the time will come when such action will be recognized as being in the public interest as well as in the interest of the individual industry concerned.

Thursday afternoon a general Conference was held with H. H. Harrison presiding. Reports of committees were received and the following officers were elected:—

President, A. B. C. Drew.

First Vice President, Oscar Stamets, Riegel Paper Corporation, Riegelsville, N. J.

Second Vice President, Grover Keets, Marathon Paper Mills Company, Rothschild, Wis.

Third Vice President, L. S. McCurdy, National Paper Products Company, Port Townsend, Wash.

Fourth Vice President, S. G. Blankinship, Brown Company, Berlin, N. H.

Fifth Vice President, Raymond S. Barton, Michigan Paper Company, Plainwell, Mich.

Secretary and Treasurer, R. L. Eminger.

Resolutions Committee Reports

The Resolutions Committee report was made and accepted and the following papers were discussed:

"Application of Research in Industry" by Evert S. Lee Mgr. General Laboratory of General Electric Company.

"Recent Developments in Pulp and Paper Mill Water Purification" F. J. Lammars, International Filter Company, Chicago, Ill.

Joint Banquet

In the evening a joint banquet was held in the Hall of Mirrors. Allan Hyer, of the Black-Clawson Company, Hamilton, Ohio acting as toastmaster. He introduced Fred C. Boyce who presented the president's Jewel. The L. D. Post Trophy was presented by John Cornell to H. H. Harrison, retiring president.

The main event of the evening was the address by George H. Mead President the Mead Corporation, Chillicothe, Ohio on "Business and Government."

Mr. Mead urged every one to take more interest in government and told how we must work to be ready to meet any crisis that may come.

The convention committee is to be congratulated on the excellent job they did in handling this convention. The convention was a splendid success and every thing was done for pleasure of all those attending.

Honorary Members

The following were made honorary members in the association:

Roger D. Smith, president, and John E. Hyde, vice-president, S. D. Warren Company, Cumberland Mills, Maine.

James F. Ryland, vice-president and general manager, Standard Paper Manufacturing Company, Richmond, Va.

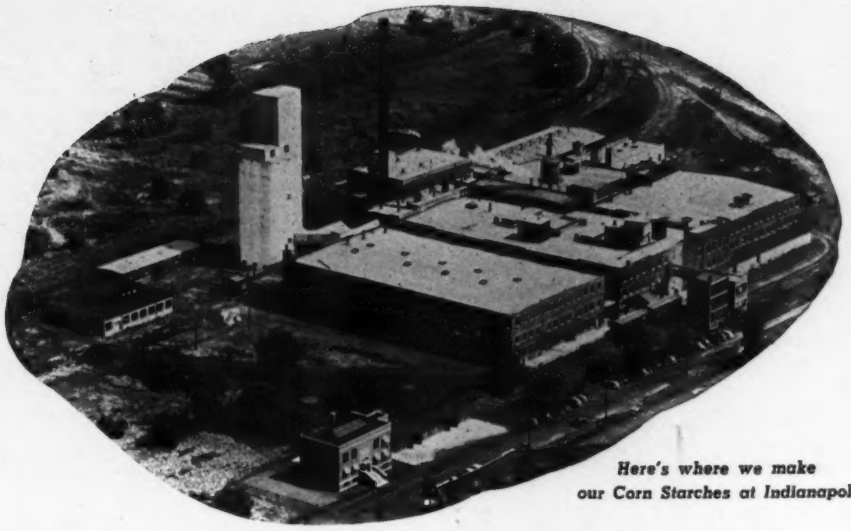
D. C. Everest, president and general manager, Marathon Paper Mills Company, Rothschild, Wis.

Milton E. Marcuse, president, Bedford Pulp and Paper Company, Big Island, Va., and vice-president, General Paper Company, Inc., Coatesville, Pa.

Logan G. Thompson, president, Champion Paper and Fibre Company, Hamilton, Ohio.

John L. Bagg, president and treasurer, Miller's Falls Paper Company, Miller's Falls, Mass., and vice-president and general manager, Parsons Paper Company, Holyoke, Mass.

A. B. Hansen, executive vice-president and general manager, Northern Paper Mills, Green Bay, Wis.



Here's where we make our Corn Starches at Indianapolis

MODIFIED—CHLORINATED FLUIDITY—SPECIAL CONVERSION

from

Corn—Tapioca—Sago

A Special Starch for Every Specific Paper Mill Need!

Our Paper Technicians are thoroughly familiar with every ramification of paper sizing and coating. They can tell you why different types of starches are best suited for various purposes—and they are also well versed in the relative merits of corn vs. tapioca. We invite your inquiries.

NATIONAL STARCH PRODUCTS Inc.

820 GREENWICH STREET, NEW YORK

Earl E. Grant, president, Crystal Tissue Company, Middletown, Ohio.

William Edmonds, secretary, Wausau Paper Mills Company, Brokaw, Wis.

George H. Mead, president, Mead Corporation, New York City.

A. G. Wilson, formerly president of the New Jersey Coated Paper Company and now associated with the West Virginia Pulp and Paper Company.

Honorary life memberships in the Superintendents' Association were given to Robert B. Stewart, Kalamazoo Vegetable Parchment Company, and A. W. Bronk, at one time general superintendent of the St. Regis Paper Company and a charter member of the Connecticut Valley Division of the Superintendents' Association.

Ladies Program

A delightful and diversified program was arranged for the ladies on Tuesday a trip to Rookwood Pottery and a luncheon at the Mariemont Inn, joining the men in the evening for a boat trip on the Island Queen to Coney Island.

On Wednesday there was shopping and sightseeing in the morning, and a trip through Proctor & Gamble "Crisco" factory in the afternoon.

Thursday included sightseeing and shopping and bridge with the joint banquet in the evening.

Papers and Technical Section

Many of the papers presented at the convention are printed in full in the Technical Section of the week's issue of the PAPER TRADE JOURNAL on page 77.

Pulp and Paper Machinery and Supply Firms Exhibit at Cincinnati, Ohio

Acme Steel Co.

The Acme Steel Company, 2840 Archer avenue, Chicago, Ill., exhibited the Acme Steelstrap and Unit-Load Processes. The flat bands are used on all types of paper shipments whether carloads, individual skids, rolls, cases or mixed carload lots. J. G. Bucuss and Mr. W. S. Huss, sales managers of the Unit-Load Division and Steelstrap Division respectively, were both in attendance assisted by N. L. Anderson and E. C. Evans. Some of the booklets offered were: "Stopping profit leaks beyond the production line," "Acme unit-load," "By rail, by water, by highway, by air," and Acme silverstitch folder.

American Rolling Mill Co.

The American Rolling Mill Company, Middletown, Ohio, featured applications of spiral welded pipe and stainless steel in the manufacture of pulp and paper. Representatives explained the advantages of "custom-made" Armco Spiral Welded Pipe with shop-fabricated fittings. This pipe is said to eliminate one pair of flanges to every bend, require fewer joints, cut installation costs, and reduce costly leakage from joints.

How Armco stainless steel paper mill equipment can cut costs and help improve the quality of pulp and paper, was the theme of the stainless display. It was revealed that stainless equipment resists rust and abrasion and helps control slime and is easy to clean and keep clean.

Visitors saw a pictorial story of the uses of spiral pipe and stainless steel. Folders were given out on both products. Literature included "More profits from cleaner paper" and "Combating slime with Armco stainless steels." The folder, "Piping costs go down—this way" and the booklet "6" to 36" pipe" also were distributed.

Barco Mfg. Co.

The Barco Manufacturing Company 1801 Winnemac avenue, Chicago, Ill., exhibited a revolving type joint for heating and cooling of paper mill rolls, drums and dryers that has been tested over the past two years and has proved very efficient for this type of service. An outstanding feature of the Barco revolving type joint is the longitudinal action of the sleeve to take care of any expansion of the roll; also the two ball seat which permits a slight misaligning action to eliminate any strains set up due to closing of flanges and unions. Another advantage of these joints is that the syphon pipe can be held up away from the bottom of the roll and located in a definite position inside the drum.

H. S. Kuhn, sales manager industrial joints, and F. W. Moore represented the company.

Beloit Iron Works

The Beloit Iron Works, Beloit, Wis., displayed photographs of the latest Beloit dual press installations, having four rolls where the suction first press roll does double duty, as it has two separate suction areas to take care of the two of the three nips in the dual press. The company also featured a new heavy-duty board machine reel and several board machine installations.

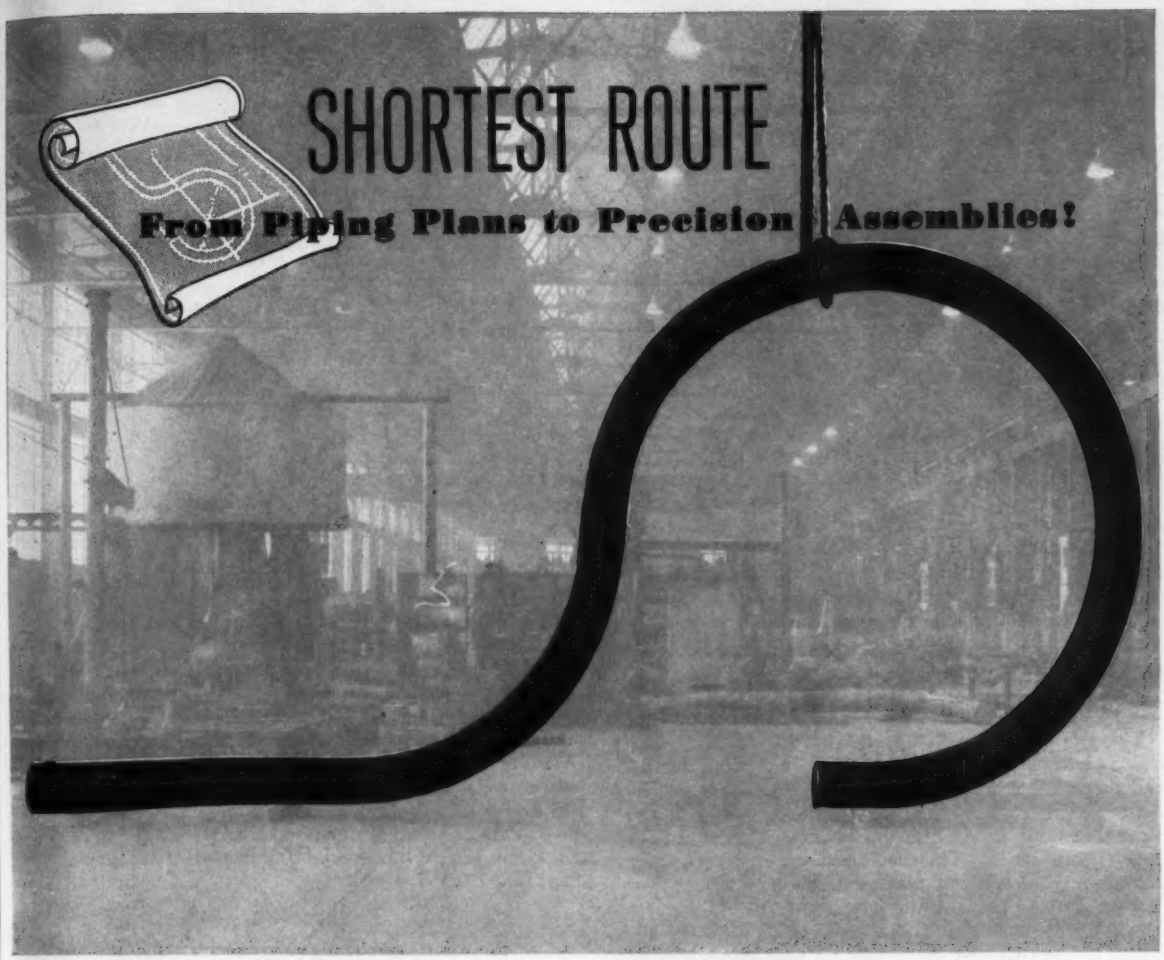
Bevis Machine Co.

The Bevis Machine Company, Middletown, O., exhibit featured a photographic display of the company's adjustable shake, bandless beater rolls, cooling drums, indenting presses, save-alls, suction couch, suction drum, suction press rolls and welded steel pulleys. Small models of some of these items of mill equipment were displayed. Representatives included S. G. Bevis, P. E. Howard, W. Beatty, and B. M. Baxter.

Cameron Machine Co.

The Cameron Machine Company, 61 Poplar street, Brooklyn, N. Y., featured at its exhibit a large scale colored map with numerous lights indicating mills in the United States and Canada where Camachine heavy-duty slitters and roll-winders are installed. These lights were connected to a flasher in groups and one group was added to another until the map sparkled with lights showing how generally Camachine winders are used in paper mills in the United States and Canada.

J. Scheuermann, the companys Mid-West represen-



GRINNELL PREFABRICATION COMBINES INTERPRETIVE ENGINEERING AND ADVANCED SHOP FACILITIES

CONSIDER the difficulties that would be involved in *field construction* of the special piping illustrated! Forty-six feet of 12¾" x .843" Carbon Moly stock . . . engineered for specific power plant service . . . formed and welded into a continuous, accurate sub-assembly.

In this instance, engineers chose a modern shorter way . . . submitted plans to Grinnell. From precise interpretive engineering of the plans, to final underwriter's testing of completed sub-assemblies, Grinnell's advanced prefabricating facilities produced this and other units of the system by efficient, straight-line methods. Accurate sub-assemblies were delivered on schedule, ready to install with minimum field-welding.

You'll save time and grief on any special power or process piping system when you specify: "Give the plans to Grinnell"! Completely-equipped Grinnell plants are strategically located to serve you. Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Branch offices in principal cities of the United States and Canada.

PREFABRICATION BY

GRINNELL

WHENEVER **PIPING** IS INVOLVED

tative was in attendance and reported that Constant Web Tension Controls and Electric Eye Side-Register Controls, as sold by his company were the source of the greatest number of requests for information.

Chromium Corp. of America

The Chromium Corporation of America, 120 Broadway, New York, exhibited profitable ways of using surface coatings of either nickel or chromium. On display was graphs of the physical properties of these metals; photographs of a nickel-plated first press roll in a board mill and of a chromium-plated smoothing press roll in service; a photomicrograph of a heavy chromium deposit on steel; and various samples and full-sized pieces of equipment that will show the protective value of chromium to designed and etched surfaces and against corrosive conditions.

A full-sized photo-engraved printing cylinder which has run well over a million impressions was displayed, still in excellent condition, having been protected against wear by Crodon plate. Knurled screen surfaces were shown on a small roll and electroplated to maintain depth and volume of the tiny cells. Another small roll is representative of what can be done with copper and Everdur in a jacket-type construction for cooling and drying where highly finished mirror-like chromium-plated surfaces are desired. Many other up-to-date items of interest were also shown.

De Walt Products Corp.

The De Walt Products Corporation, Lancaster, Pa., featured flexible power in woodworking, and exhibited their overhead arm type woodworking machines. An added feature was the continuous showing of the DeWalt sound movie film on modern methods to reduce cutting costs. The machines demonstrated their great utility. With a standard saw blade, every known sawing cut was made, including cut-off, miter, rip, bevel cut-off, bevel miter, and bevil rip. With the addition of dado heads and cutters, such operations as dadoing, gaining, grooving, rabbeting, tenoning, and many others were made. One DeWalt performed the work of many machines without sacrificing the speed, accuracy and stability that is ordinarily required of the single purpose production machine. It was acclaimed an ideal tool for pattern shop work, carpenter maintenance, outside construction, crating and boxing as well as variety woodworking.

DeZurik Shower Co.

The DeZurik Shower Company, Sartell, Minn., featured a full size stock consistency regulator. This regulator is capable of handling any type of paper or pulp stock at densities from 1.75 per cent to 6 per cent. It is designed to be used as a weight controller ahead of paper machines, for use ahead of Jordans, for slushing systems to beaters, for use ahead of and between stages in bleaching systems, for use ahead of pulp screens and wet machines or any other place where consistency or quantity of fibres must be kept constant. A full size DeZurik Shower with cut away section of sediment strainer was on display as well as large size nozzles for pulp grinders, flat screens, etc. Large illustrations of the DeZurik Knot Borer were displayed together with samples of clean and dirty pulpwood to clearly show how the machine contributes to the production of clean pulp and paper by removing dirt from the wood. A large section of the exhibit was devoted to DeZurik Easy Operating Valves for stock lines. Various styles of valves made of different metals and alloys were displayed.

David DeZurik and Otto Goeppinger were on hand to discuss any applications of these products.

Downingtown Mfg. Co.

The Downingtown Mfg. Co., Downingtown, Pa., featured motion pictures of a new development to increase the efficiency of wet pressing on board machines. The Suction-Extractor is generally applied following a plain Extractor after the last cylinder couch, and permits pressing at nip pressures up to 150 lbs. per lineal inch of roll and at vacuum up to 15 inches Hg.

Improved finish, safer operation, and increased machine production are some advantages claimed to result from recent installations.

Photographs of Downingtown's new Pulp Washer and Pressure Fourdrinier for single ply wallboards up to 1½ inches thick also attracted considerable attention from those attending the Convention.

Duriron Co.

The Duriron Company, Dayton, Ohio, exhibited Duriron pumps, valves, pipe and fittings recommended for dissolving and handling alum; also for handling sulfuric acid and chlorine bleaches. Durichlor equipment also was shown and especially recommended for chlorine solutions. One section of the booth was devoted to a display of stainless steels as manufactured by company. Especially prominent was "Durimet," a special stainless steel highly recommended for weak sulfuric acid conditions, as well as alkalies and sulfite cooking liquors. Shown also, were the 18-8 stainless steels, such as Durco KA2SMo and Durco KA2S. One special feature of these steels is their low carbon content.

Foxboro Co.

The Foxboro Company, Foxboro, Mass., exhibited a Verigraph control system for the control of moisture on paper drying, Pneumatic Loading equipment, and the Automatic Control of loading squeeze rolls and calender rolls, and a Remote Stuff Gate Control system by which the stuff gate can be controlled from the dry end of the machine.

Henry Ehrisman, O. R. Prescott, J. G. Callan, W. R. Stilwell were inattendance.

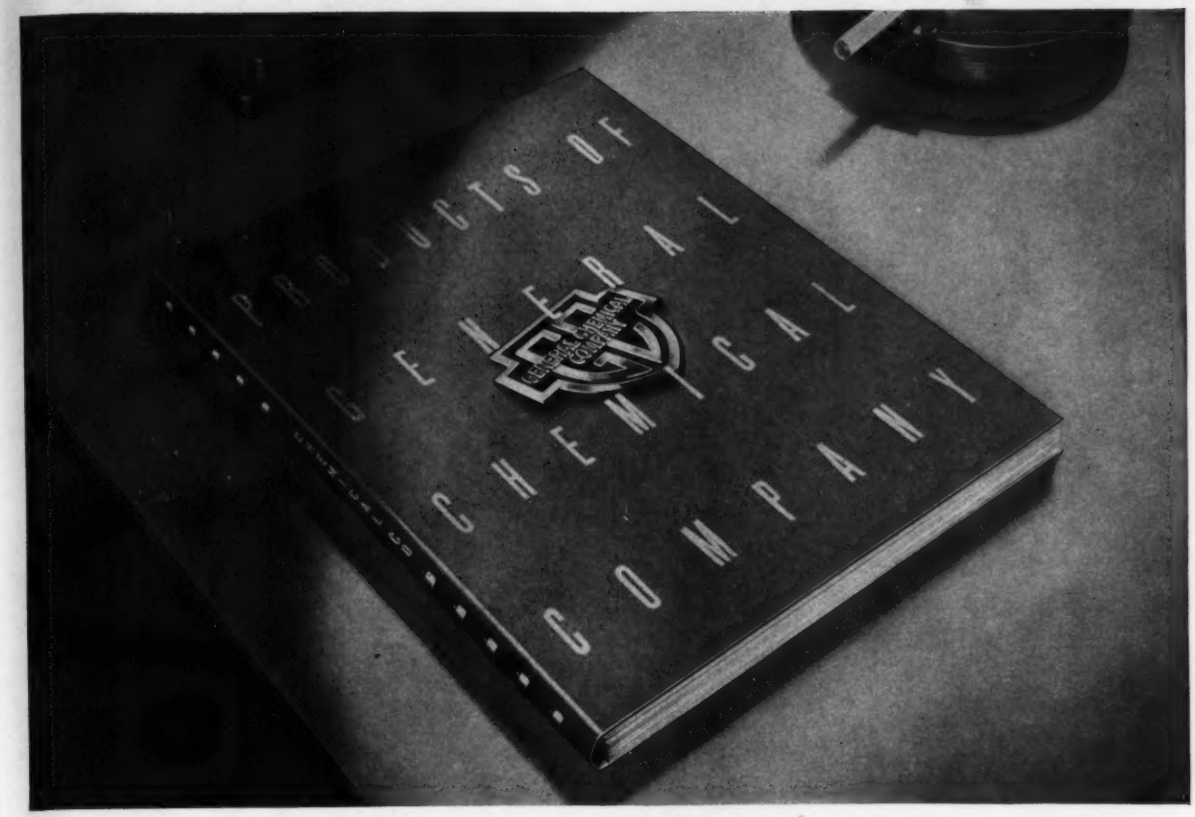
General Electric Co.

The General Electric Company, Schenectady, N. Y., exhibited a Selsyn transmitter illustrating the use of Selsyns to synchronize paper-machine drive motors, thickness gauges for the continuous or static measurement of paper thicknesses, as well as illuminated photographs of motors and control applicable to paper-making machinery. Also in the exhibit will be a renewal parts display board and a question-and-answer device operated in synchronism by means of two Selsyn motors.

Representatives included, W. W. Cronlkhite, sales manager of the industrial manufacturers section, H. W. Rogers, F. M. Roberts and D. R. Shoults, all of Schenectady; A. F. Smith and C. F. Lee of Cincinnati; P. Y. Tumy, Milwaukee; F. E. Winslow, Philadelphia; and W. L. Hilfrank, Boston.

Harris-Seybold-Potter Co.

The Harris-Seybold-Potter Company, 4510 East



A COMPLETE GUIDE

TO GENERAL CHEMICAL PRODUCTS

The new General Chemical products book contains 148 pages of pertinent facts and figures pertaining to the products manufactured by General Chemical Company.

Every one who is a buyer of industrial chemicals, and those who direct the use of chemicals in manufacturing operations should have this book—not alone for the important specifications and other information it contains on the properties of General Chemical products, but for the many new charts and tables and correlated data relative to using these products.

The book is divided into two sections. Section 1 gives a brief but thorough survey of the properties of chemicals manufactured by General Chemical Company. It provides interesting material in the way of historical and general background information as well as many photographic illustrations. This section also contains complete ordering and shipping specifications for all General Chemical products.

Section 2 of the book is a compilation of selected data, tables and charts, safety precautions and other important and handy information—much of which is published for the first time, and which should prove of genuine importance to those handling chemicals in operations. Qualified buyers and users of industrial chemicals are invited to fill in the coupon below and send it in for a copy of *Products of General Chemical Company.*

GENERAL CHEMICAL COMPANY
40 RECTOR STREET NEW YORK, N. Y.

GENERAL CHEMICAL COMPANY, 40 Rector St., New York, N.Y.
Please send me a copy of *Products of General Chemical Company.*

*Name*_____

*Company*_____

*Position*_____

*City*_____ *State*_____

PT-640

71st street, Cleveland, Ohio, featured the Seybold Precision Mill Trimmer called the Electric Auto Spacer, in a movie, entitled "Seybold has the edge." The film was especially produced to show superintendents the machine operating in several paper mills. Also on display was a spacer bar with electric control stops and carriage box parts, so that visitors could examine the automatic spacing mechanism at close range. Another Seybold machine shown was the new Precision Knife Grinder, which was of special interest to mill men on account of the wide range of work it will handle.

Representatives in attendance included, John R. Lehman, resident manager; J. C. Dabney, sales manager; Glenn D. Baber, assistant sales manager; Wm. F. Kinzeler, manager and A. C. Shively of the Central District.

Hercules Powder Co.

The Hercules Powder Company, Wilmington, Del., Paper Makers Chemical Department, had a large exhibition of paper making chemicals. A generous portion of the company's space was arranged for the comfort of visitors.

International Nickel Co.

The International Nickel Company, 67 Wall street, New York, exhibited and illustrated some of the latest and most modern paper making equipment built entirely or in part from Monel for resistance to corrosion by paper stocks and white water. This equipment included Head Boxes, Fourdrinier Wet Ends, Paper Machine Rolls, Jordans, and Cylinder Molds. Monel-covered wire and felt rolls which are used now on most of the high speed fourdriniers, were on display, and a book with data and performance records on these roll installations was especially issued for and distributed at this exhibit. The use of heat treated "K" Monel for towel and tissue creping doctors, a new and successful development, was given special emphasis.

Representatives included, E. A. Turner, T. E. Lagerstrom, R. T. Barnes of the International Nickel Company and Mr. G. E. Pickett of the company's Miami Valley sales representatives, Williams & Co., Cincinnati, Ohio.

Jeffrey Manufacturing Co.

The Jeffrey Manufacturing Company, Columbus, O., exhibited a number of samples of chains and idlers used in pulp and paper mill service, including a model of the Jeffrey Mass-Flo elevating conveyor and a Jeffrey-Traylor feeder model. These feeders are used for handling salt cake, chemicals, and other like materials.

Johns-Manville Corp.

The Johns-Manville Corporation, 22 East 40th street, New York, exhibited something new in the way of exhibits in a paper mill maintenance storeroom. Added realism was given to the orderly rows of stocked shelves by the scenes of mill activity appearing through two windows which flank the storekeeper's desk in the rear of the room. Through one window was seen a view of the beater room; through the other, the machine room. Both effects were realistically achieved by brilliantly lit murals set up behind the windows. A storeroom inventory sheet was prepared for distribution. Copies of this sheet enabled visitors to check off quickly the maintenance conditions in which they were interested and be guided directly to the proper bin to inspect regular commercial size stocks of materials.

Maintenance materials include J-M acid and alkali sheet and other special packings which, according to the manufacturer, are establishing records of exceptional service in mills. Transite pipe, an asbestos-cement product for water, pulp, and stock lines, will be featured by a special display. Other products examined are insulating, refractory, electrical and friction materials, industrial roofings, Transite, and other building materials. Products of special interest include Celite, a diatomacous earth material for the control of pitch troubles, and Eel-Slip material for suction box covers, doctor blades, and other purposes where a slippery water-lubricated material is desired.

Kidder Press Co.

The Kidder Press Company, Inc., Dover, N. H., featured a model shear cutting unit, such as is used on all its slitters and roll winders. The company continued to emphasize the importance it attaches to shear cutting and the special significance their own cutting arrangement has—not only do these cutters give an unusually clean, burr-free, dustless cut, but the steels are so chosen that cutters run for months without any maintenance cost. In fact, with the use made of specially mated steels, tested by M.I.T., the principle used actually creates a self-sharpening effect.

Several photos of recently constructed Kidder Aniliners which give every appearance of having the same kind of massiveness and ruggedness built into all Kidder products, were also shown.

In attendance were G. E. Holmes, chief engineer, from Dover, N. H., D. H. Speidel, Chicago manager, and C. P. Robinson of the Graybar Building, New York, recently appointed special representative to paper mills in the United States.

Samuel M. Langston Co.

The Samuel M. Langston Company, manufacturers of paper working machinery, Camden, N. J., exhibited enlarged photographs or blow ups of the company's advertisements in connection with Langston's slitters and rewinders.

Link Belt Co.

The Link Belt Company, 307 North Michigan avenue, Chicago, Ill., featured an operating exhibit of the Link-Belt P.I.V. Gear variable speed transmission equipped with a tachometer to show the variation of speeds obtainable, and an operating exhibit of Link-Belt herringbone-gear reducer in a transparent case to show the internal mechanism. A revolving display stand contained a complete arrangement of the various types of Link-Belt Shafer anti-friction roller bearings, both mounted and unmounted units.

Samples of babbitted type bearings, take-ups and other power transmission products; Twin Disc friction clutches; chains for conveyors, drives, barking drums; samples of Link-Belt Silverstreak silent chain and Silverlink roller chain, including the "RC" flexible coupling.

Representatives in attendance were H. F. Weber of Chicago; R. B. Holmes and G. H. Woody, Indianapolis; H. D. Mitchell, Philadelphia; H. D. Alexander, W. J. Nighbert, of Baltimore.

Magnus Chemical Co.

The Magnus Chemical Company, Garwood, N. J.,

exhibited a complete line of products for cleaning and allied needs in paper mills. Among these products were Magnus slime remover, for cleaning screens and head boxes, etc., Magnus Feltex and Saponex B for cleaning felts. Other items included Magnus suction press roll cleaner and Magnus Beatex for beater use. Representatives in attendance included T. O'Brien, Midwest district sales manager, and J. E. Ginandt, Cincinnati representative.

Mason-Neilan Regulator Co.

The Mason-Neilan Regulator Company, 1190 Adams street, Boston, Mass., exhibited for the first time to the paper industry, a line of improved and restyled indicating, recording and control instruments. Although described as "1941 Models" the instruments were announced as standard equipment for the balance of this year also. Among the features pointed out were a new, fast, amplifying pilot; streamlined, compact, universal mounting cases; newly designed airplane type dials and scales; new type chart plate; new type door lock and gaskets.

A. H. Stanton, manager of the Mason-Neilan Pulp and Paper Division, was in charge of the exhibit. Also in attendance were James McAlear and C. W. Wood.

Morrow Manufacturing Co.

The Morrow Manufacturing Company, Wellston, O., exhibited in actual production operation the Morrow-Stevens wrapping and sealing machine. This machine is designed to completely wrap and seal all papers and card stock in any weight, finish or bulk from ¼" to 5". It is completely automatic, the wrapper of any weight or finish being supplied automatically from roll stock. The blocks of paper are completely wrapped and sealed at over 900 packages per hour delivered from the machine without the slightest attention of the operator except for sliding the stock into the loading magazine provided. The equipment as exhibited has the smaller size covering the range of cut sizes from 8" x 10" to 8½" x 14". The Company also builds a larger size for converting sizes from 17" x 22" to 30" x 40".

No tape is used in making the seal and the end flaps are sealed against the end of the ream thus requiring 25 per cent less wrapping material. The finished packages are tightly sealed against dust and moisture. They are squarely and neatly wrapped and stack or pack easily, due to the uniformity of wrapping.

Mt. Vernon-Woodberry Mills

The Mt. Vernon-Woodberry Mills, Inc., Baltimore, Md., illustrated photographically the various processes employed in the manufacture of cotton and asbestos dryer felts. Particular emphasis was laid on the making of Woodberry 887s - Mt. Vernon-Woodberry Mills patented reinforced felts.

Mounted on a large background of the felt itself, a series of photographs showed each important step in the processes of dryer felt making. Starting with a picture of Columbia Mills where Woodberry 887 felts are made, the display followed with photographs of Opening and Mixing cotton, Picking, Carding, Drawing, Roving, Spinning, Twisting, and finally showing a picture of one of Mt. Vernon's huge looms, with its more than 13,000 individual warp yarns actually weaving a Woodberry 887 drier felt.

Each picture was accompanied with an interesting description of the individual process and samples of the product in its various stages of manufacture were shown.

The booth was attended by representatives of Turner Halsey Company, 40 Worth street, New York, selling agents for Mt. Verson-Woodberry Mills, as well as technical representatives from the Mill itself. This booth entertained a large number of visitors, not only because of its attractiveness, but because of the wide interest being shown in the patented feature of Woodberry 887 Dryer felts which have now been on the market for more than two years.

Nash Engineering Co.

The Nash Engineering Company, South Norfolk, Conn., featured one of their pumps of Pyrex glass in operation. These pumps, designed to eliminate corrosion are finding application in some mills in handling bleaching and alum solutions. The company also displayed a small cone-type vacuum pump taken apart to show the internal construction. Also on exhibit was a two-stage pump, consisting of two cone-type pumps connected in series to allow operation at high vacuums between 27 inches and 29½ inches mercury, for special process uses. Representatives included Carl Vicario and C. L. Clark.

National Engineering Co.

The National Engineering Company, 549 West Washington boulevard, Chicago, Ill., featured demonstrations of the Simpson Intensive Mixer. At the demonstration a 24-inch laboratory size Simpson Mixer was loaded with a 20-pound charge of clay and moisture and after an operation of about 25 minutes, a properly blended coating was discharged.

E. M. Rupp, ceramic engineer, was in charge of the demonstration.

Nichols Engineering & Research Corp.

The Nichols Engineering and Research Corporation, 60 Wall Tower, New York, exhibited the Nichols Freeman Vortrap Classifier which is a simple, compact, efficient device used for the removal of dirt from pulp and paper-making stock. The apparatus employs the multiplication of gravity effect by means of centrifugal force. The Vortrap is comparatively low in cost, requires little attendance, and permits continuous operation—24 hours a day. As its construction does not incorporate any moving parts, the maintenance cost is practically nil.

The Nichols Freeman Vortrap Classifier is being used extensively in pulp and paper mills throughout the world, cleaning all kinds of paper furnish from newsprint and kraft up to and including 100 per cent rag.

Perfecting Service Corp.

The Perfecting Service Corporation, 2622 South Parkway, Chicago, Ill., exhibited a working model of the concern's Roto Seal, for sealing joint on revolving rolls. Also displayed was a moisture content control, and the new Pyrocon bayonet thermometer for determining the temperature of the paper in the load, thus affording means for controlling the behavior of paper after manufacture.

Penick & Ford, Ldt.

The Penick & Ford, Ltd., Incorporated, 420 Lex-

ington avenue, New York, exhibited different types of Adhesives, Plasticizers, Beater Starch, Tub and Calender Sizing starches, as well as starches for enzyme conversion. Also shown was a varied exhibit of Corrugated and Laminating board, combined and lined board fabricated with various adhesives of their manufacture. In addition many grades of papeteries in which P. & F. starches had been used were displayed.

Pusey & Jones Corp.

The Pusey and Jones Corporation, Wilmington, Del., featured a continuous motion picture of the start of operations of the Southland Paper Mills at Lufkin, Tex. Photographs of recent installations of the company's Stream Flow Vat system were also displayed. The exhibit included demonstrations of the Plastometer, a standard testing instrument in connection with rubber covered press rolls.

Reliance Electric & Engineering Co.

The Reliance Electric and Engineering Company, 1088 Ivanhoe road, Cleveland, O., exhibited a working display of its all-electric, V-S adjustable-speed drive. A control panel, so located in the company's booth as to be readily accessible to interested visitors, permitted everyone who wished to do so to put the equipment through its many paces. A large, brilliantly-lighted, three foot diameter, orange-colored gear wheel, connected to a V-S Drive and mounted in a neat, glass-enclosed case, was the dramatic means used to demonstrate the starting, stopping, reversing, dynamic braking, and wide range of operating speeds possible with the V-S unit at the touch of a button or the twist of a knob.

Larger pieces of electrical equipment of interest to paper mill men which were displayed by Reliance included a Harland Interlock Regulator used in the synchronization of sectional paper machine drives, a group of general purpose, splash-proof, squirrel-cage motors, and both a.c. and d.c. gearmotors. A center of considerable interest was a disassembled gear cartridge from the latter type of motor which showed the internal construction of the unit, the means used in developing the train of gears, and the method of mounting them and sealing in their lubricant.

Robbins & Myers, Inc.

Robbins & Myers, Inc., and Propellair, Inc., Springfield, O., exhibits featured sectional and working models of Moyno pumps to handle coating materials, such as clay, starch, glues, etc., and pumps for general applications in industrial plants. The concern also displayed a line of hoists for paper mill use.

Propellair, Inc., exhibited a new type of roof ventilator, with butterfly damper that automatically closes when the fan is shut off. Also on display were several types of the concern's large exhaust fans.

Sandy Hill Iron & Brass Works

The Sandy Hill Iron and Brass Works, Hudson Falls, N. Y., featured a Bertrams Flow Distributor of small but commercial size. This was the new type head box which is now successfully operating in a number of mills. It was built entirely of mahogany, except for the flow guides which were of metal, rubber covered. All exposed metal parts of the box were of bronze. The particular flow distributor exhibited at the booth was built for a specialty machine to run a wide variety of kraft paper. Also exhibited was a Sandy Hill Bertrams Shake Head. This shake head was built according to the original design of Bertrams Limited, of Edinburgh, Scotland. The Sandy Hill Iron and Brass Works continues to be the direct representatives of Bertrams Limited in the United States, and this shake motion is based on the most accurate and up to date engineering information directly from the original designer.

Special type of Quick Opening Valves was also exhibited, as well as the mechanical principle of the roller shoe screen. In addition there was a complete set of photographs of recent Sandy Hill installations, including a number of Kamyr Wet Machines, High Density Thickeners, Washers, and other interesting exhibits.

Representatives at the booth were O. J. Mills, sales manager; J. Wesley Joslyn, staff engineer; E. C. Jacobi, special Middle Western representative; and Allen A. Lowe, staff engineer.

Shartle Bros. Machine Co.

The Shartle Brothers Machine Company, Middletown, O., included a double exhibit. On the Shartle Brothers side were three 4 foot panels depicting equipment that were first to be introduced by the Shartle Brothers Machine Company as well as a complete description of three pulpers, the breaker beater, the Miami high density pulper and the S-77 and description of the full line of centrifugal pumps manfactured by the company. There was also a large display of rejected material taken from mixed papers as removed by the Shartle Selectrap.

At the end of the booth was a movie-screen on which was projected continuously mill scenes showing the actual installations of Shartle equipment in the mill of the California Fruit Wrapping Company, the National Folding Box Company, the Frank Smith mill on kraft and actual photomicrographs of the actual fibers themselves will be projected from time to time showing the work done on the respective fibers and the number of fines produced.

On the Black-Clawson side was a full description of spiral drives and our new Fourdrinier shake with an operating model, also a full discussion and description of the seamless dryers and full details concerning the new stainless steel Fourdrinier and the all metal uniflow vats. An operating model of the Coe Drainator for use in drainage systems as well as a special test unit which is available to mills for actually checking the amount of condensate forming in any of their dryers was also shown.

In attendance were: C. R. Crawford, Chief Engineer, A. E. Bridge, Sales Manager, D. H. Montville, A. G. Gibson, O. W. Hein, P. J. Jerardi, J. A. Hamm, Sr., J. A. Hamm, Jr, H. D. Martindale, H. A. Taylor, Joe Baxter, Jr., Allan Hyer, Tom Lattimer, Rudi Kutter, Howard Buechler, S. A. Staege, and H. L. Kutter.

Socony-Vacuum Oil Co.

The Socony-Vacuum Oil Company, 26 Broadway, New York, exhibit featured the new all-color talking slide picture "Pulp and Paper Mill Lubrication." Flanking the screen, graphic still photographs emphasized the important part played by Gargoyle Lubricants in helping pulp and paper mills to keep down costs and keep up production through the use of Gargoyle Lubricants. At the right of the exhibit, transparent plastic models of a bearing, a cylinder, and gears, touched with red at the points where lubrication is vitally important, visualized the elements of

machinery. Socony-Vacuum's message was presented in a setting that reflected the importance of Gargoyle Lubricants to the pulp and paper industry.

Stickle Steam Specialties Co.

The Stickle Steam Specialties Company, Indianapolis, Ind., exhibited a representation of an actual installation on a paper machine which was a perfect simulation of the Stickle Control in action.

The company featured the new Stickle Automatic Tension and Thermal Control showing simplicity of its operation and its application to the old type Tension Control. They also showed the New Line of Stickle Valves of the Single Seated Pilot Actuated Type of Stainless Steel or Duriron Trim, the New Improved Stickle Micro Adjustable Orifice, also the New Thermal Control for controlling the surface temperature of the dryers at the same time a visible check of the flow of condensation from the dryers and the temperature of the condensation leaving, the complete line of Stickle Traps including the New Series #100 Trap which has a great many interesting features such as the internal by-pass, internal strainer, straight-in-line installation which eliminates fittings and the necessity of installing strainers ahead of the trap and valve and seat may be inspected without removing trap from line, the new Improved Stickle Sight Glass which checks the complete operation and indicates the flow of condensation from the dryers and which gives immediate check on syphon troubles or any other condition which might cause improper or sluggish drainage.

An interesting feature was the manner in which the various Specialties were demonstrated in actual operation as they would perform on a paper machine.

Sturtevant Mill Co.

The Sturtevant Mill Company, Dorchester, Boston, Mass., featured the Sturtevant-Poirier Dual Control and its wide field of application in paper mills. The three controlling functions are: control of consistency by increasing or decreasing water dilution; control of volume by correct regulation of the hydrostatic head, and by increasing or decreasing the size of the exit orifice. The company also displayed a Syphon Header and an Air-Throttling Valve. E. A. Poirier was in attendance.

Taylor Instrument Companies

The Taylor Instrument Companies, Rochester, N. Y., exhibited for the first time the Taylor Beater Roll Pressure Recorder Control Unit. The direct roll pressure measuring feature of this control unit is a Taylor development and the principal involved is the same as that of the Taylor Beater Roll Pressure Recorder developed several years ago and in successful operation in a number of representative paper mills. An interesting demonstration of the Taylor Binoc industrial thermometer was popular with the attending members.

Representatives present were: C. D. DeMers, Rochester, N. Y., Mgr. Pulp and Paper Div., Industrial Sales Department; R. H. Biederman, Manager, Cincinnati office; Henry W. Maurer, Jr., Manager, Cleveland office; N. A. Powell, Cleveland office; R. E. Flikkema, Manager, Pittsburgh office; and Hart Taylor, Pittsburgh office.

Wallace & Tiernan Co.

The Wallace & Tiernan Company, Newark, N. J., exhibited Micro-biological control in mills. Particular emphasis was laid on the sterilizing processes to guarantee purity and safety in food wrappings and containers. Chlorine control equipment ranging in capacities from ounces to tons of chlorine per day, as manufactured by W&T were exhibited. Notable among the various pieces of equipment was the new small chemical reagent feeder for accurately controlled applications of chemical solutions. Rounding out the complete line of W&T chemical feeding equipment for gaseous, liquid or dry chemicals . . . an exhibit of considerable interest was the W&T Dry Chemical Feeders. The exhibit was manned by R. B. Martin, J. A. Nicklis and M. I. Keirn, all of whom were well qualified to discuss in detail water purification, sliming or chemical feeding problems in any type of mill. With increasing demand for food package and food wrap output, low bacterial count papers and methods of biological control caused considerable interest and discussion.

Warren Steam Pump Co.

The Warren Steam Pump Company, Warren, Mass., exhibited the Warren Centrifugal Machine Chest Pump. In addition, a motor driven rotary display called attention to some of the special features which have contributed to the success of this well known equipment. Also, an interesting part of the exhibit was an enlargement of a Delivery Chart, shown by permission of one of the larger mills, and giving a graphic picture of a 24-hour record of stock level in the stuff box. Head in chest varied from 0 to 8 feet, yet the Warren machine chest pump maintained the stuff box level constant to a fraction of an inch practically throughout the entire test.

In addition to machine chest pumps attention was called to stock and liquor pumps in which the company has many years of successful experience.

John H. Hall, manager of the commercial sales department was in charge of the exhibit.

Abitibi Liquidators Lose

A press dispatch from Toronto, Canada, under date of June 21 states that Justice C. McTague has refused an application in behalf of the liquidators of Abitibi Pulp and Paper Company for leave to appeal against a judgment of Justice W. E. Middleton of the Ontario Supreme Court ordering sale of the company's assets.

Justice McTague reserved decision as to costs of the application, made by D. L. McCarthy, counsel for the company.

Justice Middleton, in a judgment June 10, directed publication of advertisements looking to the sale of the company's assets, equipment and property next October 16. Application for the order had been made by the Montreal Trust Company in behalf of certain bondholders.

The court ruled then that the bonds had been in default for eight years and no one suggested their redemption was possible. The judge said the matter had been quiescent for two years.

E. S. Reid Goes with Schmidt & Ault

The Schmidt & Ault Paper Company, York, Pa., has appointed Ernest S. Reid as one of its sales representatives. Mr. Reid will make his headquarters at room 401, 140 Federal street, Boston, Mass.

Those Who Attended the Convention

A

Mr. and Mrs. Peter J. Abel, Stickle Steam Specialties Co.
Mr. and Mrs. Ernest H. Abernethy, Southern Pulp and Paper Journal.
Mr. and Mrs. H. J. Adrian, Consolidated Water Power and Paper Co.
James J. Andrews, Fox Paper Co.
W. K. Armstrong, Central Fibre Co.
Fred E. Augustine, Gaylor Container Corp.
Chas. A. Ault, New York Color and Chemical Co., Inc.
Mr. and Mrs. A. W. Ayles, Dexter Sulphite Pulp and Paper Co.
John H. Allison, Simonds Worden White Co.

B

C. L. Bachelder, Hercules Powder Co.
G. A. Baker, Duriron Co.
R. R. Baker, Westinghouse Electric and Mfg. Co.
W. E. Bailey, Diltz Machine Works.
A. N. Ball, E. B. Eddy Co.
R. T. Barnes, International Nickel Co.
Mr. and Mrs. E. J. Barney, Cornell Wood Products Co.
W. Barnhart, American Boxwood Co.
T. M. Barry, Fraser Paper, Ltd.
Mr. and Mrs. R. W. Bauman, Johns-Manville Corp.
P. W. Bartholomew, Hercules Powder Co.
Ray L. Barton, Michigan Paper Co.
T. G. Batchelor, Hercules Powder Co., Canada, Ltd.
Mr. and Mrs. B. Beasley, Brown Paper Mill Co., Inc.
Mr. and Mrs. Gene Bechard, Tucker, Ga.
Wm. Beckett, Beckett Paper Co.
Mr. and Mrs. L. C. H. Beighey, Hammermill Paper Co.
Mr. and Mrs. H. F. Bennett, Gardner-Richardson Co.
Miss Jean Bennett.
Mr. and Mrs. M. H. Bennett, Stebbins Engineering and Mfg. Co.
Ray Bennett, Ecusta Paper Corp.
Barnard Benson, Williams Gray Co.
Chas. Bertschy, Hummel & Downing Co.
Mr. and Mrs. L. H. Bidwell, Riegel Paper Corp.
R. H. Biederman, Taylor Instrument Companies.
E. H. Bindley, Cheney Pulp and Paper Co.
C. T. Bingham, W. S. Tyler Co.
Howard W. Bogle, Central Fibre Products Co.
Mr. and Mrs. J. Bouwman, Johns-Manville Sales Corp.
Lloyd S. Bovier, Hooker Electro-chemical Co.
G. D. Bowne, Westinghouse Electric and Mfg. Co.
F. J. Brennan, Corn Products Co.
L. H. Breyfogle, Draper Bros.
Mr. and Mrs. Ralph E. Briggs, Draper Bros. Co.
Miss Betty Brydges, Big Island, Va.
Richard G. Brydges, Big Island, Va.
Mr. and Mrs. W. H. Brydges, Bedford Pulp and Paper Co.
John G. Bucuss, Acme Steel Co.
J. G. Bullard, Corn Products Sales Co.
Mr. and Mrs. John Jos. Burke, Bird & Son, Inc.
Mr. and Mrs. F. H. Burrows, Burrows Paper Co.
Mr. and Mrs. H. H. Burrows, Manhattan Rubber Co.
DeHaven Butterworth, H. W. Butterworth & Sons.
C. M. Baker, Madison Wis.
M. L. Barker, Beckett Paper Co.
A. W. Barton, Horton Mfg. Co.
F. K. Becker, Bird Machine Co.
Jos. Beckman, Signode Steel Strapping Co.
F. C. Boyce, Wisconsin Paper Products Co.
E. Burke, Jr., Michigan Steel Casting Co.
W. P. Burleigh, Bird Machine Co.

C

O. W. Callighan, Edgar Bros.
Frank C. Campins, National Starch Products, Inc.
G. N. Carleton, Detroit Sulphite Pulp and Paper Co.
John F. Carroll, Watertown, N. Y.
W. S. Casparis, Orr Felt and Blanket Co.
Charles Champion, Millers Falls Paper Co.
A. L. Chaplin, Leeds & Northrup.
C. J. Christiansen, Manitowoc Engineering Works
C. L. Clark, Nash Engineering Co.
Edwin W. Clark, E. C. Atkins & Co.
A. B. Clarke, J. O. Ross Engineering Co.
James B. Clarke, National Aniline and Chemical Co.
K. H. J. Clarke, International Nickel Co.
Mr. and Mrs. Alfred S. Clegg, Gardner Richardson Co.
Walter Clifford, Penick & Ford.
Mr. and Mrs. A. W. Cole, Rex Paper Co.
Frank H. Cole, Walworth Co., Inc.
Mr. and Mrs. R. M. Cook, Hinde & Dauch Paper Co. of Canada.
John Cornell, The Paper Mill and Wood Pulp News.
Mr. and Mrs. Harry Crabtree, E. B. Eddy Co.
G. W. Craigie, American Pulp and Paper Mill Superintendent's Association.
John J. Creeden, American Wringer Co.
E. W. Crist, Hummel Ross Co.
F. S. Crysler, Container Corp.
H. D. Cook, Sweet Bros. Paper Mfg. Co.
O. C. Cordes, Downingtown Mfg. Co.
W. W. Cronkhite, General Electric Co.

D

T. Dahlgren, Gardner Richardson Co.
Mr. and Mrs. J. T. Daker, Chromium Corp. of America.
P. E. Daley, Eastwood Nealley Corp.
T. H. Davis, Perfecting Service Corp.
Mr. and Mrs. Harry W. Deffew, Standard Paper Mfg. Co.
C. D. DeMers, Taylor Instrument Co.
R. H. Dempsey, Rising Paper Co.
Edw. E. Den Dooven, Hobart Paper Mills.
V. S. Denison, Beloit Iron Works.
Dave DeZurik, DeZurik Shower Co.
T. E. Dial, Socony Vacuum Oil Co., Inc.
Jack Dickson, R. T. Vanderbilt Co.
John R. Diggs, Pres., Salesmen Association of the Paper Industry.
Mr. and Mrs. G. A. Disbro, W. S. Tyler Co.
F. F. Dority, J. R. Booth Co.
Joseph H. Dow, Castle & Overton, Inc.
Mr. and Mrs. Lewis Dozier, Rhinelander Paper Co.
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F. B. Dubuc, Turner Halsey Co.

RHOADS TANNATE WATERSHED BELTING» ANOTHER CASE OF DISTINGUISHED SERVICE ON PAPER MILL DRIVES

Shortened once in 15-16 years!

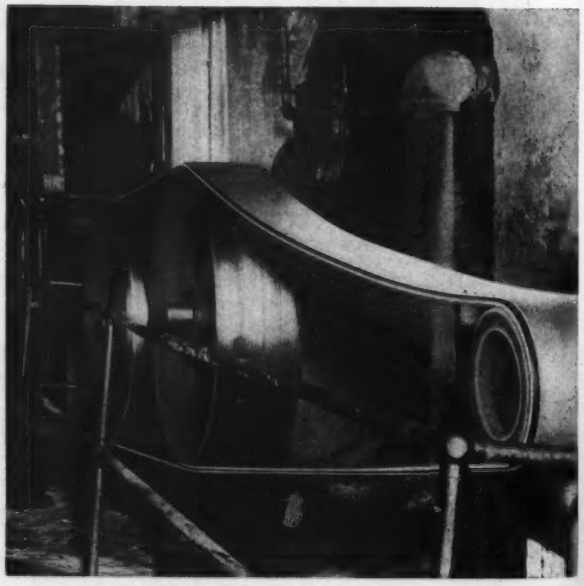
Wouldn't you be satisfied with belts that had given 15 and 16 years exceptionally fine service—with one shortening in all that time?

This is the performance record of a Tandem TANNATE belt drive and a 75 HP motor drive with TANNATE belt installed by a Virginia paper mill in 1924 and 1925.

But, there is more to the story—

This period of service under adverse conditions of dampness and temperatures up to about 108° the year around would make the performances of these belts already much more than "satisfactory", BUT, REPORTS THE MILL MANAGEMENT, THE BELTS ARE STILL IN EXCELLENT SHAPE AND CAN BE EXPECTED TO GIVE YEARS MORE SERVICE!

TANNATE Watershed Leather Belting is long lived, highly efficient and dependable. It will pay you to investigate the TANNATE possibilities in your plant.



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F

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Harry C. Fisher, Gardner Richardson Co.
Mr. and Mrs. L. E. Fitzgerald, Hercules Powder Co.
E. T. Fleming Jr., Fleming & Sons, Inc.
E. Paul Floyd, Simonds Saw & Steel Co.
P. M. Foster, Williams-Gray Co.
C. G. Frampton, Fernstrom Paper Mills, Inc., California Fruit Wrapping Mills.
Donald A. Fraser, Fraser Industries, Inc.
Mr. and Mrs. Herbert F. Freas, Spaulding Fibre Co.
Val Friedrich, Jr., Beckett Paper Co.
Mr. and Mrs. LeRoy Frisbie, Westfield River Paper Co.
Mr. and Mrs. Harry D. Frost, The Sinclair Co.
F. F. Frothingham, Bird Machine Co.
F. W. Fuller, National Engineering Co.
E. M. Ferguson, Horton Mfg. Co.
J. S. Field, Ohio Knife Co.
Mr. and Mrs. M. B. Fortune, Rochester Paper Co.

G

Mr. and Mrs. W. W. Galloway, The Bauer Bros. Co.
J. N. Gammon, National Oil Products Co.
H. L. Garvens, Chromium Corp. of America.
A. C. Gault, W. S. Tyler Co.
O. P. Gephart, Miamisburg Paper Co.
A. G. Gibson, Shartle Bros. Machine Co.
E. C. Gildenzopf, Schmidt & Ault Paper Co.
Tom Gillespie, Pennsylvania Felt Mfg. Co.
J. E. Ginandt, Magnus Chemical Co.
Otto J. Goeppinger, DeZurik Shower Co.
Herman Goldberg, Samuel M. Langston Co.
R. H. Goldsmith, Pusey & Jones Corp.
E. R. Granger, Chromium Corp. of America.
W. E. Greene, Stowe-Woodward, Inc.
Mr. and Mrs. Alan H. Griffin, Riegel Paper Corp.
H. Griffin, Riegel Paper Corp.
L. L. Griffiths, Williams-Gray Co.
Fred. H. Grim, Robbins & Myers, Inc.
Robert M. Guie, Philadelphia Felt Co.
H. B. Gerber, Williams Gray Co.
Wm. P. Gruendler, Gruendler Crusher and Pulverizer Co.

H

Mr. and Mrs. R. W. Haddock, Escanaba Paper Co.
G. Bancroft Hall, Morey Paper Mill Supply Co.
John H. Hall, Warren Steam Pump Co.
Mr. and Mrs. George W. Hardaker, The Sinclair Co.
A. A. Harden, Corn Products Sales Co.
J. F. Harding, Shuler & Benninghofen.
S. S. Harkavy, Geigy Co.
Mr. and Mrs. H. H. Harrison, Crystal Tissue Co.
Ray E. Harter, R. T. Vanderbilt Co.
George H. Harvey, The Gardner-Richardson Co.
Arthur L. Hobday, Southworth Co.
A. S. Hocker, Clays & Paper Research, Inc.
Mr. and Mrs. Fred. Hodgemire, Hawthorne Paper Co.
Parker B. Holden, Stowe-Woodward, Inc.
Roy W. Holden, Stowe-Woodward, Inc.
G. E. Holmes, Kidder Press Co.
R. B. Holmes, Link Belt Co.
Clayton Holt, Diamond Alkali Co.
Joseph Hollihan, Port Huron Sulphite and Paper Co.
J. R. Hoover, B. F. Goodrich Co.
H. A. Horan, Penick & Ford, Ltd., Inc.
A. A. Hormel, J. E. Rhoads & Sons.
A. E. Hughes, Michigan Alkali Co.
Harry Hulmes, U. S. Rubber Co.
H. Harvey, Penick & Ford, Ltd.
Mr. and Mrs. J. D. Haskell, Dilts Machine Works.
Mr. and Mrs. K. E. Hancock, Hopper Paper Co.
James D. Hay, Dexter Folder Co.
Mr. and Mrs. Charles W. Hayes, Dexter Sulphite Pulp and Paper Co.
Mr. and Mrs. David F. Hayes, Lawless Brothers Paper Mills.
James L. Hayes, The American Pulp and Paper Co.
Otto Hein, Shartle Brothers Machine Co.
J. W. Hemphill, Johns Manville Corp.
John D. Henderson, Fritz Publications.
Mr. and Mrs. Albert A. Hentschel, Flintkote Co.
G. A. Hermann, Hermann Mfg. Co.
W. L. Hilfrank, General Electric Co.
W. S. Huss, Acme Steel Co.
Mr. and Mrs. O. F. Hutchinson, Bulkley Dunton Pulp Co.
Allan Hyer, Black-Clawson (Shartle Bros.)

I

Tom Ireland, Crane Co.

J

Mr. and Mrs. E. C. Jacobi, Sandy Hill Iron and Brass Works, Inc.
Miss Margaret Jacobi, Hudson Falls, N. Y.
F. I. Jacoby Riegel Paper Co.
P. J. Jerardi, Shartle Brothers Machine Co.
E. A. Johnson, National Aniline and Chemical Co.
Walter A. Johnson, Hoberg Paper Mills.
Geo. J. Jones, Crane Co.
H. Duncan Jones, Manhattan Rubber Mfg., Division.
J. W. Joslyn, Sandy Hill Iron and Brass Works.
E. B. Janvrin, The Bristol Co.
Nels G. Johnson, Simonds Worden White Co.

K

W. D. Kavanaugh, American Cyanamid and Chemical Corp.
Mr. and Mrs. H. E. Karberg, Alliance Paper Mill, Ltd.
Grover Keeth, Marathon Paper Mills Co.
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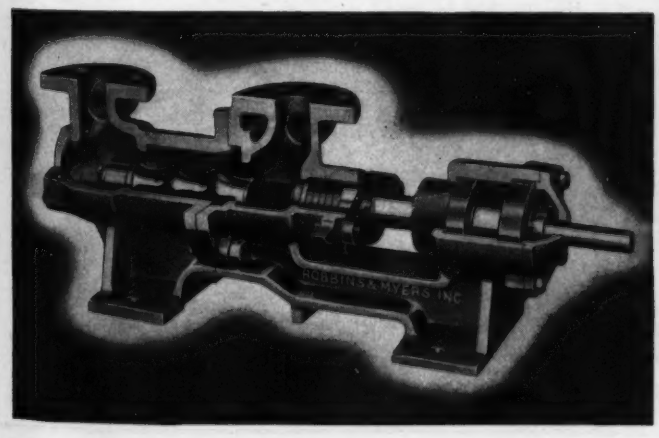
The Moyno Slip Pump has no valves or pistons. A rotor with a single helical thread turns within a stator having a double helical thread, forcing the slip ahead of the helical surfaces with constant pressure without turbulence, foaming, or cavitation. It acts the same as though a piston were moved forward with uniform speed through a cylinder of infinite length. As a result of this extremely simple, "one-moving-part" construction, wear is kept at a minimum, necessary repairs made infrequent, and lost pumping time all but eliminated.



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Mr. and Mrs. D. B. Kimball, Eastman Kodak Co.
H. C. Kinne, Shartle Bros. Machine Co.
W. F. Kinzeler, Harris, Seybold Potter Co.
Ray P. Kirkeide, Magnus Chemical Co.
Robert Kissel, Hoberg Paper Mill.
F. P. Knack, F. C. Huyck & Son.
F. E. Kneip, Nichols Engineering and Research Corp.
W. C. Knoeppel, American Brass Co.
R. J. Knowles, The Nekoosa Edwards Paper Co.
Mr. and Mrs. Robert H. Kohs, Detroit Sul. Pulp & Paper Co.
R. L. Kutter, Black-Clawson and Shartle Bros.
M. I. Keirn, Wallace & Tiernan Co., Inc.
N. M. Kennedy, Pennick & Ford, Ltd., Inc.

L

T. E. Lagerstrom, The International Nickel Co., Inc.
Mr. and Mrs. Lester H. LaLiberte, Kalamazoo Vegetable Parchment Co.
Bryant W. Langston, Samuel L. Langston Co.
C. W. Larson, Corn Products Sales Co.
O. E. Larson, The Emerson Mfg. Co.
H. T. Latham, Dupont Co.
T. H. Latimer, Shartle Brothers Machine Co.
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Ralph M. Leighton, Stowe-Woodward, Inc.
Russ LeRoux, Consolidated Water Power & Paper Co.
Mr. and Mrs. J. R. Leslie, Alliance Paper Mills, Ltd.
J. D. Lowery, American Cyanamid and Chemical Corp.
Mr. and Mrs. C. J. Ludwig, Mead Corp.
W. F. Luking, The Waterbury Felt Co.
R. G. Macdonald, Technical Association of Pulp and Paper Industry.
W. W. Macklen, Black-Clawson Co.
L. E. Longstreth, Container Corp. of America.
A. C. Loomis, Heller & Merz.
John H. Loomis, Heller & Merz.
J. C. Lowe, Shartle Brothers Machine Co.
F. J. Lammers, International Filter Co.

M

W. M. MacNeir, Weyerhaeuser Timber Co.
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Hoke Martin, Hercules Powder Co.
R. V. Martin, Wallace & Tiernan Co.
Geo. J. Maye, Appleton Wire Works.
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Mr. and Mrs. E. J. McDonnell, International Paper Co.
Miss Louise McGrath, Booth Chemical Co.
W. M. McGraw, General Electric Co.
A. McLintock, Texas Gulf Sulphur Co.
C. J. McMahon, Appleton Woolen Co.
Richard F. McNett, The Bauer Bros. Co.
Miss Besse Merrithew, Fritz Publications, Inc.
Mr. and Mrs. O. W. Messner, Robertson Paper Box Co.
W. K. Metcalfe, J. O. Ross Engineering Co.
Jack Miller, Crane Co.
O. J. Mills, The Sandy Hill Iron and Brass Co.
T. B. Mobley, E. C. Atkins & Co.
W. H. Monsson, Hooker Electro Chemical Co.
Don Montville, Shartle Bros. Machine Co.
Walter B. Morehouse, National Oil Products Co.
Mr. and Mrs. M. O. Morris, Case Bros., Inc.
T. H. Morrissey, Shuler & Benninghofen.
Frank C. Morrow, Morrow Mfg. Co.
Mr. and Mrs. Allan A. Muir, Mead Corp. Heald Div.
L. T. Murphy, Tennessee Paper Mills.
J. M. Murray, Gaylord Container Corp.
J. M. Moon, Signode Steel Strapping Co.
Mr. and Mrs. J. L. Mullen, Hopper Paper Co.
D. C. Murchison, Howell & Murchison, Inc.

N

Herbert Niehaus, Gardner-Richardson Co.
V. M. Norwood, Johns-Manville Sales Corp.
John J. Nylund, General Dyestuff Corp.
S. J. Naughtrip, Toronto Paper Mfg. Co.
A. W. Nickerson, New York, N. Y.
J. A. Nickilis, Wallace & Tiernan Co., Inc.

O

J. J. O'Brien, The Paper Mill and Wood Pulp News.
T. F. O'Brien, Magnus Chemical Co.
Robert O'Donoghue, New York, N. Y.
C. J. O'Neil, Johns-Manville Co.
Mr. and Mrs. J. W. Outerson, Patterson Parchment Paper Co.

P

H. P. Petzold, Oxford Miami Paper Co.
J. D. Platt, Simonds Worden White Co.
M. W. Phelps, The Solvay Process Co.
G. E. Pickett, International Nickel Co.
E. A. Poirier, Sturtevant Mill Co.
H. G. Potts, Pennsylvania Salt Mfg. Co.
George Pountain, International Paper Co.
Glen E. Price, National Starch Products Co.
E. L. Puffer, Heller & Merz.
John L. Purdy, The Orr Felt and Blanket Co.
Mr. and Mrs. William G. Putney, Philadelphia Felt Co.
Mr. and Mrs. Thomas E. Palmer, Mead Corp.
R. G. Paramore, Central Fibre Co.
Mr. and Mrs. Jacob Parent, Noble & Wood Machine Co.
D. D. Patrick, Cheney Pulp and Paper Co.
Allan Patton, Fraser Industries, Inc.
Mr. and Mrs. L. B. Penhallow, Socony Vacuum Oil Co., Wadhams Div.
George Pennock, Bagley & Sewall Co.
E. Peterson, B. F. Goodrich Co.
Mr. and Mrs. Ernest W. Petersen, Mosinee Paper Mills Co.
G. A. Peterson, Rice Barton & Fales, Inc.
Mr. and Mrs. R. T. Petrie, Shartle Brothers Machine Co.

R

Mr. and Mrs. R. M. Radsch, Appleton Machine Co.
J. W. Raines, The Lindsey Wire Weaving Co.
Mr. and Mrs. C. E. Raney, Monroe Paper Products Co.
George Raymond, Central Fibre Co.
A. W. Redlin, Beach & Arthur Paper Co.
Walter S. Reed, Dexter Folder Co.
Wm. Reigers, Beckett Paper Co.
Mr. and Mrs. Geo. H. Rice, Kalamazoo Vegetable Parchment Co.
A. Wm. Riedel, Gus Riedel & Son.
Douglas Robbins, Douglas Robbins & Co., Nichols Research and Engineering Co., Robbins & Myers, Inc.
F. M. Roberts, General Electric Co.
T. C. Roberts, Beloit Iron Works.
H. W. Rogers, General Electric Co.
K. L. Rohrbach, Johns-Manville Co.
Edward M. Root, Dilts Machine Works, Inc.
J. Roslund, Asten-Hill Mfg. Co.

(Continued on page 106)

WILLIAMS STANDARD CHIP CLASSIFIER

Saves Its Cost Many Times Over

CONTROLLED CHIP LENGTH

Saves:—

WASTE OF WOOD from oversize uncookable chips and sawdust.

In some mills, this loss runs as high as 19% of total wood bill. Most of this waste is preventable.

COOKING CHEMICALS

Increases:—

MULLEN AND TENSILE TESTS of pulp.

DIGESTER YIELD.

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WATERTOWN, N. Y.

Col. Franklin Dead

Col. Benjamin A. Franklin of 36 Bellevue avenue, secretary-treasurer of the Specialty Paper and Board Affiliates, Springfield, Mass., industrial engineer and business councilor, died at Wesson Memorial hospital after a brief illness which had not been considered serious.

Col. Franklin resigned as vice-president of the Strathmore Paper company in 1932 after 21 years in that post. Long identified with business life of this section, he had served as first vice-president of the Chamber of Commerce and had been widely active in civic organizations. He was colonel in the ordnance department of the United States army and was chief of the Hartford ordnance district of the war department.

Col. Franklin was born on the Cobbs Hall estate in Northumberland county, Va., October 15, 1869. His father died while Benjamin was still a child, and he was reared and educated by his mother, attending a school in Baltimore, Md. He later pursued a course in mathematics and physics at John Hopkins university, Baltimore.

His first employment was as clerk with the Midvale Steel company of Pennsylvania in their steel casting department and he became assistant superintendent of the department, remaining in that position for 13 years. He then went to Boston as general manager of the United States Steel company when that concern was new and having a hard struggle to gain a firm foothold.

In 1909 Horace Moses of the Strathmore Paper company, engaged Col. Franklin as an efficiency expert and he was subsequently appointed vice-president, in which capacity he remained until 1932, when he resigned. During these years he also attained prominence as the author of "Cost Reports for Executives" published in 1913; "Experiences in Efficiency," published in 1915 and "The Industrial Executive," published in 1925.

At America's entry into the World war, Col. Franklin was called into the service as an efficiency engineer, entering the ordnance department and developing a capacity in corporations for the production of 50,000,000 shells in three months. He was made a major in September, 1918, and was sent to Bridgeport, Ct., as production manager of the Bridgeport district. At the end of the war he was made district chief of the Bridgeport division for closing down business and settling claims and was made chairman of the claims board. Promoted to lieutenant-colonel, he was decorated in October, 1919, with a distinguished service medal for his valuable work during the war.

Col. Franklin was a member of the American Society of Mechanical Engineers, the Society of Industrial Engineers, the American Management association, National Association of Cost Accountants, had been vice-president of the Associated Industries of Massachusetts.

He also belonged to the American Society of Social and Political Economy, the Taylor society and the International Management institute.

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PAPER TRADE JOURNAL

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Henry J. Berger
EDITOR

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COMING EVENTS IN PAPER INDUSTRY

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Fall Meeting, Olympic Hotel, Seattle, Wash., August 20-23.

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

NATIONAL SAFETY COUNCIL, PAPER AND PULP SECTION, Annual Meeting, Stevens Hotel, Chicago, Ill. October 7-11.

BUSINESS RAPIDLY EXPANDING

The outlook for industry and trade for the last half of this year is viewed by most leading business men and economists as the most favorable in many years. Huge expenditures for national defense for the fiscal year beginning July 1 have been provided by Congress of more than four billion dollars and nearly one billion dollars more has been authorized to be expended on contracts for which appropriations will be made at a later date. Although at least two-thirds of this sum of nearly five billion dollars will be spent for such durable goods as are essential for national defense, it is forecasted that so extensive a spending program will also be reflected in an uptrend in all industrial and trade activity in the next few months.

With billions of dollars appropriated for purposes of national defense, economists of the government are considering the possibility of inflation. Expenditures for defense, it has been explained, will result in additions to industrial plants and will stimulate the heavy or durable goods industries. This will tend to increase prices generally and to utilize more of the country's resources in idle bank funds and, as prices advance, particularly of raw materials, some form of governmental direct price control is expected to follow.

But, while the effect of national defense expenditures is expected to greatly stimulate all business activity in the future, it is encouraging to note that the state of current business is rapidly advancing to a higher level of activity. It has advanced sharply within the last two weeks, making larger gains this month than in any like month during the last seven years. This acceleration of business is indicated in the index of general business activity which rose to 102.4 per cent for the week ended June 15, from 99.3 per cent for the preceding week, compared with 90.6 per cent for the week ended June 17, 1939. May business activity, measured by check payments, exceeded that of last year by 10.8 per cent. Throughout the nation, business was reported better than the national average in 23 States, about equal to the national average in 6 States and below the national average in 19 States.

A possible rise of $20,000,000,000 in the national income was predicted by James W. Young, Director of the Bureau of Foreign and Domestic Commerce, in an address before the American Association of Independent Small Business, in Washington. Mr. Young stated in part: "What is going to happen to business in this country when we get our new defense program going full blast?" In answering that question he said: "From the Department of Commerce studies of national income we know that currently our national income is running at the rate of about $70,000,000,000 a year. We also know that, if we can get all our idle plant capacity and all of our idle men fully employed, we will have, at present price levels, a national income of about $90,000,000,000 a year. We believe that the heavy defense expenditures which we are presently to make are likely to bring about a full utilization of our productive capacities, and that as this comes about, we will have a period of very intense business activity in all lines in this country."

In order to speed up the national defense program all controls which impede industry should be removed, declared the board of directors of the United States Chamber of Commerce, in a statement issued on June 22, insisting that Congress remain in session with short recesses and urging that in order to aid national defense all possible retrenchment in other expenditures should be made. "National defense, as business envisages it," said the chamber's statement, "means a great deal more than the production of guns, ships and airplanes for our armed forces. Equally important, it requires the reinforcement of our whole economic front, strengthening it all along the line. More pointedly, it requires not the imposition of new government controls but the removal of old ones which act as a brake on our industrial machine. It requires a healthy fiscal policy, rigid economy in non-defense expenditures; encouragement for new capital invested in new defense plant and equipment, and a comprehensive, long-term revision of our entire tax structure. It requires a modification of labor legislation which prevents smooth employer-employee relations, unrelenting vigilance against subversive elements which would undermine our democratic institutions and destroy our American way of life. It requires assurances that the gigantic rearmament pro-

gram shall be carried on within the dimensions of our free enterprise system."

The statement by the chamber also condemned dictatorial trends and said in part: "It requires that labor, agriculture and business stand together in the fight against all dictatorial trends and in the task of resolving our own internal problems. In this period it is essential for the future of our country that our national policies be foresighted. Our objective must be security through strength and through the preservation of our republic. As a nation at peace we should work against possible involvement in conflict. Preparation, rapid and complete, against such a calamitous eventuality is the greatest safeguard against it. Hysteria has no place in this preparation."

Champion Starts New Paper Unit

HAMILTON, Ohio, June 22, 1940—The Champion Paper and Fibre Company has announced here that its new $3,500,000 paper plant started operations today in Houston, Tex., to manufacture paper coated directly on the paper machine for national magazines, and bond, envelope and tablet paper for the southwestern markets. The new plant marks another milestone in Champion's development in the Southern States. In 1907, the company started operations in Canton, N. C., to manufacture sulphite, soda pulp and chestnut extract. Twelve years later a sulphate mill was added to produce fifty tons of bleached kraft a day, and since that time the capacities of the pulp mills at Canton have been increased to 200 tons of bleached sulphate, 120 tons of bleached sulphite and 140 tons of bleached soda pulp per day.

In 1937, Champion expanded to Pasadena, Tex., 12 miles from Houston, opening a $3,000,000 mill for the manufacture of bleached kraft from Southern pine wood. The pulp manufactured in this plant was sent to Champion's Hamilton, Ohio, mills to be made into paper, and some was sold on the open market. The new Texas paper mill is an addition to the pulp mill, and will manufacture paper on a straight line production basis, utilizing part of the present day facilities.

The bulk of the paper from the new mill will be used by Time, Inc., for *Life* magazine, for which Champion has contracted to supply part of their paper requirements.

Champion's Texas pulp mill was built in 1937 on the Houston ship channel, providing low cost water transportation for much raw material, and for shipping products. Southern pine grows in great profusion in the immediate area of the plant, providing an almost inexhaustible supply of raw material. Natural gas for fuel exists in very large quantities. The company owns a large salt dome within piping distance from the mill. At present salt is purchased from nearby Louisiana mines for production of chlorine for bleaching purposes and hydrogen which is sold in local territory. Lime is made from oyster shells dredged from enormous deposits in Galveston Bay—and shipped to Champion's wharves in barges via the ship channel. The estimated capacity of the new paper mill addition is 120 tons per day of machine coated paper and other grades of uncoated paper.

The new mill will add $400,000 to the Houston Champion payroll.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1940	1939	1938	1937	1936	1935	1934
January	90.2%	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	86.2%	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	83.9%	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	86.3%	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	91.5%	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	.....	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	.....	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	.....	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	.....	88.7%	76.3%	78.6%	80.5%	71.9%	58.2%
October	.....	96.6%	82.5%	73.5%	87.6%	75.6%	64.7%
November	.....	97.2%	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	91.1%	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	84.9%	72.3%	80.6%	81.3%	70.5%	.....
First 24 weeks	88.3%	81.2%	67.5%	90.2%	79.1%	69.2%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1940		CORRESPONDING WEEKS, 1939	
May 11	90.5%	May 13	82.0%
May 18	92.4%	May 20	81.3%
May 25	93.7%	May 27	79.9%
June 1	90.0%	June 3	74.2%
June 8	93.5%	June 10	79.3%
*June 15	94.3%	June 17	79.0%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	May 11, 1940	May 18, 1940	May 25, 1940	June 1, 1940	June 8, 1940	June 15, 1940
0% to 50%	48	42	41	58	36	34
51% to 100%	252	250	252	234	244	195
Total Mills Reporting	300	292	293	292	280	229

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%
1940	71%	70%	69%	70%	76%	....	....

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	84%	81%	71%	70%
1940	....	....	....	....	....	....

Week end. May 11, 1940—74%
Week end. May 18, 1940—76%
Week end. May 25, 1940—79%
Week end. June 1, 1940—75%
Week end. June 8, 1940—77%
Week end. June 15, 1940—79%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.
* Preliminary figure.

Japan Expects Higher Pulp Prices

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 24, 1940—Japanese pulp importers expect higher prices for American and Canadian pulp owing to the difficulty in securing adequate supplies from northern Europe. It is pointed out that pulp imports into Japan during January included 21,798 short tons of pulp for the manufacture of rayon and 918 tons for the manufacture of paper.

Manufacturers Ship More Paper

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 24, 1940—During April the value of manufacturers' shipments in the paper and allied products industry was 124.2 taking January 1939 at 100. In March the index was 118.8, in February 119.1 and in January 118.8, according to the Department of Commerce.

A NOVEL WAY TO SAVE MONEY

From a large collection of old-fashioned mechanical savings banks comes this amusing contraption for saving money, called "Driving the Mule Into the Barn." It is operated by springs. First a coin is placed between the mule's heels. When a lever is pressed, a little dog runs out from the barn and jumps at the mule who kicks up his heels and throws the coin over his head into the barn, which cannot be opened except with a special key.

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Causes for the Recent Interest in Bacteria in Paperboard*

By Harry C. Fisher[1]

Abstract

Some of the factors which have caused advanced interest in the bacterial content of paperboard are discussed.

A new subject or an old one in a new setting always occasions widespread interest. Such has been the case with bacteria or microorganisms in paper in the last few years. Here we have an old subject in a new setting, perhaps a crystallization of old ideas into a clearer understanding. At any rate, the verbiage exhausted on this subject in recent years, if laid end to end, would extend from the average wood lot to the finishing calendars of an ordinary self-contained paper mill.

Every superintendent and technician, at some time or other, has coped with problems of slime, mildew, and perhaps mold, in the papermaking system; the familiar problem of spoilage of starch solution has been encountered. These are tangible things requiring acute observation for their recognition and good practical methods for their control but they do not require the sensitive methods of microbiological analysis for their identification. Slime spots in paper or board, mildew on felts and the bad odor of spoiled starch solution can be detected quickly by the ordinary senses without use of the ultrasensitive technique or specialized knowledge of the bacteriologist. If the paper breaks continuously on the paper machine, the chests and pipes are full of slime, and the paper or board contains slime spots, it is reasonable and practicable to deduce that slime is causing the trouble. Even the remedy for this can be a practical one which does not require too much reliance on the bacteriologist.

On the other hand, we now are presented with the problem of speaking numerically and qualitatively about the bacteria content or other microorganisms in paper or board. Even though to the unaided eye the sheet may appear to be as clean as freshly bleached fibers it may have conceivably a content of invisible matter which makes it unallowable, if not unsuited, for certain uses.

Just what is this furore about the testing of paper for content of bacteria and about proposed standards for same with which we are faced now; can it be that for years on end we have been making and selling paperboard that is a menace to health? Can it be that along with the advancement of paperboard making from an art to a science, a fashionable "disease" has been acquired requiring an operation? Or, can it be that the expanding use of paper and board has at last entered a field in which qualities heretofore not important now need recognition and control?

Basic Purity of Paper and Paperboard

To the first two queries the answer is "Certainly, not!" Paper and board essentially are as harmless and as inert as any class of materials in common use today. From the softest of paper handkerchiefs to the toughest of paper towels, from the strongest of fiber shipping cases to the most particular of milk containers, paper and board have performed and will continue to perform a clean sanitary exacting service. True it is that one would not use plain chip for butter cartons or colored suit box board for milk containers; fundamentally, selections of board for a given use are controlled by common sense. Having exercised common sense in the selection of the board for a given use we can assert, without fear of contradiction, that paperboard is basically so clean that no one ever is likely to suffer by the use of that board as a container for anything held therein. This is not to say that milk containers, for example, should be made from board less high in quality than that now in use, or that standards for the cleanliness of any kind of board should be relaxed. The statement merely refers to the fundamental cleanliness of paper products and the papermaking process.

Any discussion of the bacteriological or, more correctly, the microbiology of paper, sooner or later encounters the paper milk container. No doubt, to many of us, the current interest in sanitarily clean board is a new thing; on the other hand, it is an old story to those who have made paper or board for ice cream and oyster pails, bottle caps, butter cartons, etc. It is the paper milk container that has focused attention to the sanitary quality of paperboard.

It is a curious thing that this attention expresses itself in the form of requirements and standards for board established on the basis of the quality of board obtained when highly sanitary materials and manufacturing conditions are used and maintained rather

* Presented at the Annual Convention of the American Pulp and Paper Mill Superintendents Association, Cincinnati, Ohio, June 18-20, 1940.

[1] Member TAPPI, Chief Chemist, The Gardner-Richardson Co., Lockland, Ohio.

than on the basis of performance of the board under conditions of use as a container.

For instance, some of the milk bottle board made during the early days of the present development had a bacterial colony count much greater than is considered allowable now, but there are no instances known where the health of anyone suffered from drinking milk from a container made from such board. Later, a couple of years ago, a bacterial colony count of 500 per gram of paperboard came to be considered a fair standard for milk container board. But there is no record that anyone showed by specific investigation that milk container board having a higher colony count, say, of 1500 colonies per gram. is unsuitable for paper milk containers. Then, in 1939, the United States Public Health Service proposed a standard of 100 colonies per gram of paper and the figure finally adopted is 250 per gram. We are assured by the United States Public Health Service that a revision of this figure up or down will be made upon cause.

Milk Ordinance and Code[2]

The Milk Ordinance and Code is recommended for adoption by states and communities in order to encourage a greater uniformity of milk-control practice in the United States.

Quotations from this Milk Ordinance and Code (Public Health Bulletin no. 220—1939 edition) follow: Under Section 7: Item 10p—

"(5) The manufacture, packing, transportation, and handling of single-service containers and container caps and covers are conducted in accordance with the following requirements. Inspections required herein may be made by the health officer or by any agency authorized by him.

"(b) The average bacterial plate count of the stock from which single-service containers and container caps and covers are made shall not exceed 250 colonies per gram. No substance shall be present in finished single-service containers and container caps and covers which is toxic."

While the present paper is not particularly concerned with the processing of milk bottle board into the milk container, for the sake of completeness reference will be made to the subsequent paraffin treatment which such containers receive and which serves further to act as a bactericidal treatment. The Milk Ordinance and Code continues, under Section 7, Item 10p, with the following:

"(e) All single-service containers and container caps and covers shall be so treated as to be as impervious to milk and milk products as practicable.

"(f) All single-service containers and container caps and covers shall prior to use be given bactericidal treatment equivalent to contact with paraffin for at least 20 seconds at at least 180 deg. F., or for at least 35 seconds at at least 175 deg. F., or for at least 1 second at at least 225 deg. F., in approved equipment operated in an approved manner. The bactericidal treatment equipment shall be provided with approved indicating and recording thermometers, and shall be so designed as automatically to insure the required temperature and contact time."

It should be stated in explanation that the recommended specifications of the United States Public Health Service are copied widely by state and local boards of health and thus become the local law, so to speak. These recommendations are the result of painstaking, high quality investigation and deserve intelligent consideration.

Description of Microorganisms

To be strictly correct, the title of this paper should refer to microorganisms instead of bacteria inasmuch as the bacteria are but one class of microorganisms. Microorganisms, which are those tiny organic bodies so small as to be seen only under a powerful microscope, include the bacteria, yeast, molds, algae, fungi, etc. They are measured in terms of the micron, a micron being 1/1000 of a millimeter or 1/25,000 of an inch. Many of these microorganisms are the friend of man. There are myriads of them all about us and even within us, some good, some bad. Some of these microorganisms, under the influence of environment unsuitable for continued growth and increase in numbers, pass into a spore stage, a sort of seed stage, and there they remain dormant or inactive until such time that favorable conditions again promote their resumption of activity as a living, active, reproducing microorganism. On the paper machine, the heat and steam of the driers, the chlorine or other bactericidal treatment of the stock, the low water content of the finished board, the absence of food in the paper to support life of microorganisms, etc., lead to the destruction of all but the most resistant kinds of organisms. Certain kinds of spores are resistant and thus much, if not all, of the so-called bacterial content of paper board will be composed of spores. The point I wish to make at present merely is that even under the worst conditions the paper or board product does not "crawl" with bacteria.

Colony Counts

The procedure for making a plain colony count is to pulp or disintegrate a piece of the paper or board in water, to mix a small portion of the resulting pulp with a mass of food, in melted condition, suitable for feeding and growing the microorganisms, to allow the mixture of paper pulp and food to cool to a gelled condition in a glass receptacle called a Petri dish, to place the dish and contents in an incubator in which the temperature remains constantly at 37 deg. C. for 48 hours, and finally to remove the incubated plate and actually to count the colonies, that is, groups or spots of microorganisms, which have developed and grown from the individual organisms or spores present in the sample of paper or board. Knowing the weight of sample used and number of colonies counted, the result is expressed as the number of colonies per gram of the original sample. The whole procedure must be carried out with sterilized instruments and equipment and with the specialized technique of the trained bacteriologist.

When such tests are in progress the characteristic atmosphere of the surgical operating room must prevail. There can be no answering of the telephone or "knocking off" for lunch or a cigarette in the middle of a test. One well-placed sneeze or the flick of the porter's broom spoils the work of days! Moreover, if the original sample is not taken with care to assure that it is absolutely uncontaminated by external conditions, no amount of skill during the running of the test will serve to tell the true condition of the sample of paper or board before it was tested.

The end result of a colony count test on paper or board is that the growth of each single organism or, perhaps, group of organisms, yields a speck or spot, that is, colony of organisms, easily seen by low power magnification or even the unaided eye. Therefore, the colonies can be counted and the quantity calculated into terms of numbers of colonies per gram of sample of paper or board when tested under these conditions.

While the test results of a colony count are expressed quantitatively, the interpretation is largely qualitative. If one sample of milk container board tests 200 colonies per gram and another 100, it hardly follows that the latter is twice as clean as the former.

[2] Recommended by the United States Public Health Service.

The interpretation is that both are clean. But if several samples of the former consistently test around 200 colonies and, of the latter, consistently test around 100, one can reasonably conclude that the content of microorganisms of the former indicates it to be appreciably cleaner than the latter, although the difference is slight. However, should one piece of board, not milk container, test 10,000 colonies per gram and repeated tests lie in that general range, there can be no doubt that in a bacteriological sense the high count board is less clean than the low count board. Even so, the board with high colony count may be, and probably is, harmless. We are told on good authority that the papermaking process, in general, is such that disease-producing microorganisms cannot survive the process of manufacture of the paper or board.

Calculations for colony count usually employ the logarithmic average. In a series of tests at a given time the logarithms of the last four tests are determined, added, and averaged, and this figure converted back into the colony count, that is, the average colony count. Such method is adopted in dairy work because it has the effect of eliminating inequality due to an occasional very high colony count which experience has shown not to be a true index of bacterial conditions.

Your indulgence is asked for the time spent on the technical details of determining colony counts but the procedure must be known if one is to understand the meaning of the present interest in colony count in paperboard. Further, one must realize that the job of determining just what kinds of microorganisms are present is for the person trained in bacteriology.

What Has Caused the Recent Interest

Now that we all have a common understanding of the simple terminology of this subject we are able to appreciate the answer which is short, indeed. The paper milk container has caused the recent interest in bacteria or, more broadly, microorganisms in paperboard.

Passing reference to the history of the paper milk container may not be amiss. It is stated that the paper container for milk made its first appearance in this country in 1909, in California, where a man named Maxwell proposed the use of a cup-like paper milk bottle which he treated with melted paraffin to waterproof it. Freedom from germs was stated to be an advantage of this paper container. Due to commercial difficulties, this early paper container was not successful and it was not until 1929 that paper milk containers again became prominent, this time in the eastern part of the United States. It was not until 1935 that the paper container for milk became a recognized factor in the dairy industry. Now the use of various shapes and kinds of paraffined milk containers has grown to such an extent that at present some two million are used daily throughout the United States. There has been a wide use of such containers in foreign countries, also.

Facts found from studies of the paper milk container can be translated directly into kinds of paperboard. There has been a surprisingly large amount of study and research by institutions of high rank on the microbiology of paper and board and products made therefrom. Among these are:

University of Illinois—under Doctors Tanner, Prucha and Tracy
The Institute of Paper Chemistry
New York State Agricultural Experiment Station—under Doctors Breed and Sanborn
Sanitary Committees of the National Paper Board Association and the American Pulp and Paper Association.

A few years ago when the paper milk container first became a factor in the eastern United States, the health authorities in New York City apparently deemed it advisable to have a scientific organization study this container with the object of determining its suitability. They referred the problem to the New York State Agricultural Experiment Station. Since then, this and other scientific organizations have conducted related studies on particular kinds of containers, methods of paper and board manufacture, processes for converting board into containers without impairing sanitary quality, etc. The net result has been the collection of a considerable body of knowledge about the microbiology of paper and board. Some of the information is not new but all of it is valuable in its assembled form whereas formerly it was scattered knowledge. The writer wishes to acknowledge these various sources for much of the information contained in this present talk.

Bacterial Destruction on Driers

The bacteriologist recognizes two general divisions of microorganisms—the pathogenic or disease-producing organisms and the nonpathogenic ones, or those not producing disease. We are assured, on good authority, that the pathogens never, or rarely, survive the punishment they receive in the papermaking process including on the paper machine. Experiments have been reported wherein paper leaving the press roll section of a paper machine has been inoculated with strains of pathogenic bacteria and the bacteria could not be found by bacteriological tests after the paper had passed over the heated paper machine driers. Such tests, together with a consideration of the heat and steam conditions of a drying web of paper or board on the paper machine driers, and a knowledge of the thermal death point of various organisms, have established quite conclusively that common pathogenic organisms are killed on the paper machine driers.

With particular reference to paper milk containers, it has been pointed out that a drying web of paper or board on paper machine driers is exposed to a higher temperature and for a longer time in steam, on the driers, than is required for the flash pasteurization of milk. Inasmuch as milk is one of the most perishable, if not the most perishable, of foods, it is an excellent yardstick to use for measuring high sanitary quality of paper or board. One set of conditions for the pasteurization of milk is set forth under Part II, Section 1, item L, of the U. S. Public Health Service Milk Ordinance where pasteurization is defined as the process of heating every particle of milk or milk products ". . . . to at least 160 deg. F. and holding at such temperature for at least 15 seconds, ..." Surely, a web of paper or board on the heated driers reaches this temperature and higher for a longer time than 15 seconds.

What, then, is the meaning of the colony count of paper or board if disease-producing organisms do not survive passage over the driers? The authorities tell us that a colony count is a measure of good housekeeping. Slime in beaters, chests, pipe lines, etc., can come over the sheet and will appear in the colony count. Mold organisms conceivably might pass through the entire papermaking process and appear

in the colony count. The spores of many non-pathogenic organisms are very resistant to the heated drier conditions, hence, can be present in the finished board and will appear in the colony count. Under favorable conditions of temperature and humidity these organisms might increase in a piece of paper. Fortunately, air dry paper is far too dry to promote such growth and if the paper is reasonably clean there is no food to promote such growth. Indeed, there are data to show that the colony count of paperboard stored under ordinary clean air-dry conditions decreases with the passage of time. We read that even when paper is inoculated with strains of live bacteria and allowed to stand under ordinary room conditions, these live bacteria are found to have died as time passes.

After leaving the paper machine driers, the web is calendered, say, with a water or starch finish. Contaminated water or starch solution in the calender boxes will ruin the cleanest of sheets and convert a negligible colony count into a sizable one even though the appearance of the sheet is unchanged. The familiar wad of stock used to dam water boxes cannot be tolerated since it of itself will contaminate otherwise clean water or starch solution. Metal calender boxes with composition dams are preferred. Particular care must be taken to prevent calender contamination.

So far as the pathogenic microorganisms are concerned, the process of papermaking contains natural safeguards. The use of chlorine and ammonia and the various chemicals which have toxicity to certain microorganisms can be relied upon to maintain the wet end of the papermaking system in a clean condition. Thereafter, the heat of the paper machine driers can be relied upon to kill pathogenic bacteria. A natural safeguard automatically comes into play on the paper machine driers. If the paperboard leaves the driers too wet, it cannot be calendered and is not satisfactory for use, regardless. If the web is dried sufficiently and properly so that a usable sheet of board results, such conditions of temperature and time will have prevailed on the driers that pathogenic bacteria or similar microorganisms will have been destroyed.

Raw Materials Used in Paper

A sheet made of unclean stock probably will have a colony count of nonpathogenic organisms measured in the thousands per gram. A sheet made from fresh, clean pulp in a clean beater room with a clean wet-end system furnished with unpolluted water, well chlorinated, free from slime, accumulations of old stock, etc., will show a comparatively low colony count, say, a couple of hundred down to none. The latter sheet, formed into a container and treated with clean, hot, melted paraffin, is an eminently satisfactory container for liquid foods. Common sense, aside from health considerations, dictates that the former sheet be not used for liquid food even though pathogenic bacteria are not present. For one thing, such a sheet, paraffined or not, does not have the clear, clean, appearance and odor associated with a liquid food package.

Virgin stock is a phrase which has come into use in recent years in connection with paper and board low in colony counts. The Milk Ordinance and Code does not use the term but there is at least one instance where the idea has been written into a local health department ordinance. Virgin stock is defined as stock which never before has been used for commercial purposes. Such would include fresh, clean bleached or unbleached sulphite, sulphate, groundwood, soda and aspen pulps, etc. Trim from unconverted board made of such stock can be considered to be virgin stock. Slush stock fed directly from the pulp mill answers to the definition. No doubt, an extension of the classification to include other suitable grades of fibrous material will arise in time.

Chemicals, size, clays, starches, etc., added to the stock in the beater room ordinarily do not cause serious contamination although one cannot disregard the possibility. It is not alone a question of their own ability to cause contamination but also the cleanliness of the equipment and methods of handling.

The recently revised Federal Food, Drug, and Cosmetic Act has occasioned discussion among technicians with reference to microorganisms and color of paper and board, especially after conversion into cartons or other containers. Section 402-a-6 of this law states "A food shall be deemed to be adulterated —if its container is composed, in whole or in part, of any poisonous or deleterious substance which may render the contents injurious to health." Similar statements appear in Section 501-a-3, and 601-d, referring to Drugs and Cosmetics, respectively.

Section 501-a-3 reads—"A drug or device shall be deemed to be adulterated—if it is a drug and its container is composed, in whole or in part, of any poisonous or deleterious substance which may render the contents injurious to health."

Section 601-d reads—"A cosmetic shall be deemed to be adulterated —if its container is composed, in whole or in part, of any poisonous or deleterious substance which may render the contents injurious to health."

Conclusions

So far as the speaker knows, these provisions of the law have not been tested in our industry to date. It would appear, from the complexity of the subject, from the multitude of things which can be packed in paper containers, from the widely varying mutual effect of contents upon package, and vice versa, that individual instances of violation would have to be considered separately. Fortunately, these mutual effects, if any, follow definite scientific laws. This, together with the fundamental cleanliness and nontoxic nature of paper and board, speaks well for the ability of paper and board to be engineered and designed for a given purpose as a carton or container for food, drugs and cosmetics.

In this connection, the limitations of colony counts and specification of stocks used for liquid food cartons is a reasonable device designed to prevent foreign tastes and odors and to aid the natural safeguards of the papermaking process. Foods of low or negligible moisture content do not present the same problem as liquid foods; the absence of sufficient water militates against microbiological life. Inasmuch as the colony count in paper and board is largely, if not completely, due to harmless spores, it seems farfetched to think that any microbiological content of paper or board can be deleterious or poisonous to food.

We have had the satisfactory performance for years on end of packing all kinds of foods in paper and board, to rely upon as demonstrating their intrinsically satisfactory quality for such purposes. With the exercise of common sense in the selection of suitable grades for the various kinds of foods, we will have continued success in using paper and board for food packages.

Colored boards also need comment in connection with the Food, Drug and Cosmetic Act. Customers are prone to inquire whether board of this or that

color can be guaranteed to be satisfactory under provisions of the Act, for packing a given kind of food. A comprehensive answer to customers' question sounds evasive; a simple answer cannot be given. Apparently there is no law dealing specifically with the question.

A letter from the Food and Drug Administration, recently received by the writer, states:

"While colors for paperboard intended to be used as food containers are not subject to certification, such colors should be of a character that they will not result in contaminating food with which they may be in contact so as to bring the food within the ban of section 402 (a)(6) . . . ."

Sometimes there is inquiry about the cost of coloring board with certified food colors, that is, colors or dyes which themselves pass the requirements of the Food, Drug and Cosmetic Act. Such certified colors are used to color foods, drugs and cosmetics and thus will be eaten, brought into contact with the skin, etc. Such dyes themselves are very expensive, and, when available, cost dollars more per pound than the corresponding technical grade. Moreover, the range of colors obtained with certified dyes is limited.

Possibly the best answer to make to the customer on this color question is to explain the mechanics of the coloring process; to explain the difference between colors "set" on the fibers and those not "set"; to explain something about the constitution of the color or dye itself and impurities which may be present in the color or dye as received ready for use; to explain how a color or dye is certified; etc. With these explanations in mind it may not be too much to expect customer to realize that the relation between product packed against or otherwise contacting colored paper or board, and the colored paper or board itself is a complex one requiring coordinated knowledge of customers product, the papermaker, and the converter of paper and board. It seems unreasonable to expect the papermaker to be an expert on the effect of his colored paper on each and every material packed therein.

However, although the papermaker cannot blindly guarantee his colored product as satisfactory for holding customers' food, for example, under the Food, Drug and Cosmetic Act, he can ascertain, in a practical way, whether it is likely to be satisfactory. If there is no possibility of contamination of the food by adsorption of dye and/or accompanying substance from the wrapper or container, these cannot act to contaminate the food. If the coloring matter is known to be nonpoisonous, intrinsically, if it is firmly "set" onto the fibers, if it does not smudge, "bleed" or rub off onto the food, especially when warm, wet, or moist, and over a long period of time, then the chances are that the colored paper product will withstand scrutiny under the Food, Drug and Cosmetic Act. It is a good rule to make a detailed study of each coloring job proposed and to enlist the aid of the person who packs the food or other article in the colored paper or board.

Sorting Papersheets by Machine*

By Walter S. Reed[1]

Abstract

A discussion of the problems of sorting and the development of a sorting machine for paper sheets is given.

Our researchers spent several months of intense field investigation, supplemented by questionnaires to many men in the paper industry, primarily to ascertain if the sorting of paper could be mechanized, and secondly to find out what problems would have to be solved if this mechanization of the sorting process was found to be practical.

Elements Comprising the Process

Time and motion studies of girl sorters indicated that the process of hand sorting comprised the following fundamental elements: (a) one pair of eyes, (b) one pair of arms, (3) one pile of paper, and (d) a certain hour rate of pay—which currently seems to average 40 cents.

The trick seemed to be in so training that pair of eyes and arms that the sheets would fly through the air, and while in that state of agitation all imperfections would be detected and imperfected sheets rejected.

The sorters with uncanny accuracy and at unbelievable speeds, did spot the imperfect sheets—and as you know, they had about fourteen broad classifications of defects to find, many of which were subdivided into various minor groups.

It became apparent to the research engineers that: (a) a pair of human eyes, as contrasted to the photo electric eye in its current stage of development, was a prerequisite in the development of the mechanical sorter; (b) a pair of arms was wholly unessential; (c) a sheet could be inspected in motion within certain limits of sheet speed; (d) most imperfections—over 90%—could be observed by one side sorting; and (e) only one-third of the girls' "eye time" was spent actually inspecting paper, with two-thirds consumed in the operations of handling the sheets, jogging, straightening, etc.

The Problem Simply Defined

Therefore, the problem resolved itself into one rather simply defined, to wit: to design a machine which would utilize the operator's eye to the fullest extent, consistent with the ability of those eyes accurately to detect imperfections in a sheet of paper passing before them, with due regard to eyestrain and fatigue factors. Having arrived at what we considered an accurate definition of the problem, it was essential to find and adapt the mechanical factors which would aid in its solution.

As the utilization of the human eye to its fullest extent was a prerequisite to the development of mechanical sorting, it was essential that the factors of eyestrain and fatigue, plus speed of operation, receive consideration. Fortunately, time and motion studies formed the basis for conclusions which were founded on facts rather than on opinions.

We knew that a girl sorter, if provided with the mechanical devices to neutralize the physical fatigue inherent in hand sorting, could actually turn and inspect paper at the rate of at least 3,000 sheets per

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[1] Dexter Folder Co., Pearl River, N. Y.

hour—but she couldn't maintain that rate for any length of time because of physical exhaustion. In other words, if she could maintain the speed at which her eyes were capable of detecting imperfections, she would produce ten reams per hour or eighty reams in an 8-hour day. Quite obviously that production could not be obtained with any degree of continuity, not only because of a physical limitation, but also because she had to straighten, jog, and sometimes count sheets. The average production for an 8-hour day for quality hand sorting seems to be about ten to twelve reams in most mills. This indicates that the average hand sorter is delivering about one-eighth of her actual capacity to see the sheets and detect their imperfections.

Translated Into Money Values

Translated into money values—and assuming the girl sorter producing as high as one-third of her capacity instead of the 12½% indicated—the mills were paying not an average of 40 cents per hour for that pair of eyes, but closer to $1.40 per hour for the actual sorting of paper. Apparently in hand sorting provision could not be made to utilize the full capacity of the girl's eyes and the mills were paying a high premium for inspection because of that limitation.

The engineers reasoned that if the sheets were presented to the girl on a table at a slow rate of speed —each in the same relative position and with each sheet having the same perspective—you would then be capitalizing fully on the $3.20 per day which you spend for each pair of eyes for inspecting purposes.

Then, quite obviously the inspector would have to be relieved of any straightening, jogging, or spatting of sheets, as this operating alone consumed at least a third to one-quarter of her time.

Engineers Conceive Mechanical Sorting

The engineers visioned a combination equipment to take a pile of paper five feet high from the cutters, automatically feed each sheet to a sorting table, count and jog the good sheets as well as reject and jog the imperfect sheets. This would concentrate all of the girl's attention on inspecting the sheet. She would do nothing with it except to let it go through to a pile delivery if it was a good sheet, or by a simple turn of a tripping mechanism located right near her hand, reject the sheet if it happened to contain imperfections. We, therefore, designed the present sorting machine, which has been undergoing field tests in both the coated paper and bond mills. It consists of an automatic stream feeder; a sorting table; a reject mechanism with a jogging delivery for imperfect sheets, and a jogging pile delivery and counter for perfect sheets.

The next factor which bothered us for a time, was the speed of the sheet at the point of inspection. Fortunately, a new method of feeding sheets had originated whereby a very high rate of speed could be maintained at the feeding point, which rate was reduced to one-fifth of that speed at the point of inspection by the underlapping of the sheets being fed, with the rate again accelerated to full speed at the delivery point.

For example, assume an automatic feeder operating at the rate of 5,000 sheets per hour, or ten reams of paper every sixty minutes. If these sheets were advanced to the sorting table on a one-to-one basis, with each sheet following the preceding one without space intervals, you would have a continuing web on which it would be next to impossible to detect imperfections, or at least to obtain quality sorting. Now assume that same feeder operating at the same speed of 5,000 sheets per hour, with each sheet underlapping the preceding one by one-half to two-thirds of its width, and continuing this process with each sheet fed. In terms of sheet speed the resulting effect is amazing; the sheet travel at point of inspection is at the rate of only 1000 sheets per hour, or one-fifth of the actual speed at which the sheets leave the automatic feeder. The rate of sheet travel per square inch of area surveyed is no more than with high speed hand sorting. The eyes of the inspector are utilized to their maximum capacity for sorting only. The machine brings the sheet to the inspector; permits it to be surveyed over its entire surface while moving at a low rate of speed, and counts, delivers, and jogs it at a high or the feeding rate of speed. This naturally makes it possible to obtain maximum output with no sacrifice in quality of sorting.

Field tests have demonstrated quality sorting with an output of as high as sixty-six reams in eight hours —a little over eight reams per hour—which is from four to six times the average of hand sorting. These tests were in a bond mill on one of the smaller size unit machines— 42 by 58 inches maximum sheet size. On the larger machines, with an area to be surveyed of 52 by 74 inches we estimate that a reasonable production would be in the neighborhood of fifty reams or better every eight hours.

Advantages

This system of machine sorting means that the average mill can obtain four to six times the output of a hand sorter and at least twice the output of mechanical sorters now on the market. It reduces the damage and waste, particularly on the large size sheets which are being demanded more and more because of the trend towards bigger presses. It enables a better concentration and utilization of the floor space in the average finishing room. It likewise gives an automatic "time study" or "paced" operation analogous with a measured work day as a better control factor in finishing rooms. Furthermore, by blowing air into the pile, as the sheets are being fed, the stock is aerated, which helps in the seasoning process and in the equalization of the moisture content, at the same time eliminating a portion of the paper dust. Primarily, to the printer, mechanical sorting means that the mill paper has been prefed on an automatic feeder.

Conclusion

As you will observe from the foregoing, mechanical sorting resolved itself into a combination of factors, which in practice relieved the inspector of all physical effort, by providing a machine to convey each sheet before the inspector's eyes, at a low rate of speed at the inspection point; incorporating the functions of counting and jogging good sheets without any effort on the inspector's part, and rejecting and jogging imperfect sheets merely by operating a tripping lever with a slight motion of the hand. In other words, mechanical sorting means capitalizing on two-thirds of the time now spent by the hand sorter in operations other than sorting, and getting full value received for the pair of eyes hired to do a sorting job.

Paper Coating Pigments*

By A. E. Hughes[1] and H. F. Roderick[2]

Abstract

Various paper coating pigments are discussed and the suitability of each pigment for specific purposes is outlined. A comparison of the paper coating properties of clay, lithopone, satin white, calcium carbonate, blanc fixé and titanium dioxide is given in graphical form.

The properties of coated papers prepared from pigment blends of calcium carbonate with clay, lithopone, satin white, blanc fixé, and titanium dioxide individually are discussed.

In general, papers may be classified into two groups —namely, coated and uncoated papers. While papers may be coated with thin films of various substances, the industry has succeeded up to the present time in confining the term *coated paper* to papers which have been coated with a film of some pigment or combination of pigments cemented together and to the surface of the paper with some adhesive.

The term *pigment* is not too well defined. Its origin and common usage have directed its meaning largely toward colored materials and lakes and, to a lesser extent, toward finely divided, relatively insoluble, white mineral substances. In the field of coated paper our greatest interest lies in the white pigments such as clay, calcium carbonate, and the lithopones.

The Requirements of Paper Coating Pigments

The requirements and specifications laid down for pigments by most producers of coated paper are exacting. The pigments must be:

1. Readily and easily dispersed in water
2. Free of grit and abrasive materials
3. High in opacity and covering power
4. Of a desirable particle size
5. Low in alkalinity, with a pH value not very far above the neutral point
6. Medium in adhesive requirement or size demand
7. Medium in water absorption
8. Bright and possess no noticeable off-color.

Many other requirements may be mentioned, but they are not essential for keeping within the purpose of this paper.

Because of the fact that pigments which are employed in coated paper in large amounts must be within the keeping of these requirements and must also be available at a reasonable price, only a small part of the total number of pigments known can be used for this purpose.

Properties of Paper Coating Pigments

Pigments which meet these requirements and are suitable for use in the preparation of coated papers are clay, satin white, calcium carbonate, titanium dioxide, blanc fixé, and lithopone.

Clays

Both domestic and foreign clays are widely employed and serve as a basis for most coating colors. Clays are classified into various grades by particle size, and some are chemically treated, bleached and refined. Most clays, even after treatment, are almost invariably an off-white in color and low in brightness. Therefore, other pigments of high brilliance are often employed along with clay for improving the brightness as well as other properties of the finished paper.

Satin White

Satin white is one of the oldest pigments known in the coating industry, aside from clay, and it still enjoys a wide use; because it can be substantially relied upon for improving the finish of most coated papers as well as for improving the brightness of those carrying relatively large amounts of clay.

Satin white is readily prepared by reacting hydrated lime and aluminum sulphate and adding small amounts of gum arabic or some other dispersing or stabilizing agent. Its preparation is no longer considered a major problem in most paper mills.

Calcium Carbonate

By virtue of the fact that it is a good brightening agent and may be obtained in various grades at reasonable prices, calcium carbonate is widely employed as a coating pigment. It may be used alone or may be blended with other pigments in the preparation of coating colors. Comparatively recent developments in the manufacture of this pigment have made available various grades ranging from course, dull finishing materials to those possessing a high degree of brightness and opacity and which may be employed in the preparation of coated papers high in smoothness, ink receptivity, and finish.

Blanc Fixé

Blanc fixé is somewhat higher in price than the pigments just described, but, because of the fact that it possesses certain desirable properties, quantities are employed in coated papers.

Lithopone

Various grades and types of lithopone are available, and for certain types of coated papers this pigment is desirable.

Titanium Dioxide

Of all the pigments suitable for coating paper, titanium dioxide has decidedly the highest brightness and opacity or covering power. However, because it is rather expensive, its uses are limited, being confined to specialty papers and as an extender for less expensive pigments.

The Properties of Coated Papers Prepared From Individual Pigments

While certain properties of various pigments may be readily described, it is virtually impossible to arrive at a definite comparison of any number of pigments without resorting to laboratory and mill tests. We have, therefore, selected a paper coating grade of each of the above-mentioned pigments and evaluated it by laboratory means. These laboratory evaluations are being verified wherever possible by actual mill

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[1] Research Laboratories, Michigan Alkali Co., Wyandotte, Mich.
[2] Member TAPPI, Director of Research, Michigan Alkali Co., Wyandotte, Mich.

runs, and, while the problem is by no means completed, we do feel that our findings in the laboratory are worthy of presentation at this time.

The comparison of the individual pigments was made by preparing coatings from each of the pigments with varying amounts of casein and brushing these coatings onto a standard raw stock at the rate of 16 pounds per 500 sheets 25 by 38 inches.

The evaluation of the raw stock employed is:

Basis weight (25 x 38—500)	41.5 lb.
Bursting test	16.3
Tear (in grams):	
Machine direction	30.0
Cross direction	35.4
Thickness	.004 in.
Size test (dry indicator)	26.7 sec.
Porosity (Bekk)	27
Smoothness (Bekk)	25
Opacity	87
Brightness	81

All test sheets prepared were calendered by a paper mill on a regular calender stack. The finished sheets were evaluated according to the standards of the TECHNICAL ASSOCIATION of the PULP and PAPER INDUSTRY, and the results are given in graphical form so that they may be the more readily comprehended.

CASEIN DEMAND

The casein demand of the various individual pigments is shown in Fig. 1. This chart will enable one to predict with reasonable accuracy the amount of casein required by each pigment to impart to the coating a bonding strength equivalent to any given Dennison wax. Titanium dioxide, lithopone, blanc fixé, and domestic clay are classed as having a low casein requirement. English clay and calcium carbonate are medium in casein requirement, while satin white is a high casein requirement material. None of the curves shown are linear in nature, and the chart in general shows why it is virtually impossible to calculate the amount of casein required by a given mixture of pigments for a definite wax test, when only the requirement for each of the individual pigments is known. In arriving at the amount of adhesive required by a certain mixture of pigments, it is by far the safest plan to prepare the blend and run a size demand test on the blend itself.

BRIGHTNESS

Brightness, or a high degree of whiteness, is essential in most coated papers. A comparative rating of the brightness of each individual pigment is given in Fig. 2. Satin white, titanium dioxide, and calcium carbonate are the highest in brightness of all the pigments studied. Increasing amounts of casein cause a gradual decrease in brightness of the finished sheets for all of the pigments.

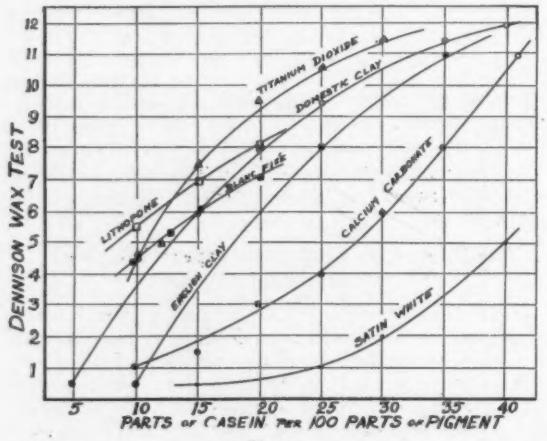

FIG. 1.
The Casein Demand of Various Paper Coating Pigments

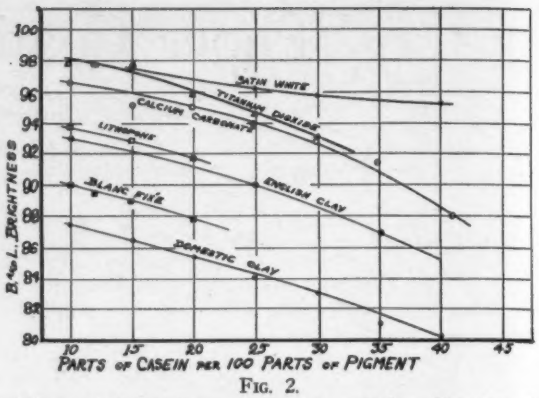

FIG. 2.
Brightness of Coated Papers Prepared from Various Pigments and Sized with Increasing Amounts of Casein

OPACITY

The opacities of coated papers prepared from satin white, titanium dioxide, calcium carbonate, English clay, domestic clay, lithopone, and blanc fixé with increasing amounts of casein are given in Fig. 3. Satin white, titanium dioxide, and calcium carbonate are higher in opacity than the remaining materials. Since the same weight of coating is applied to all of the sheets, it is obvious that there is a gradual decrease in the actual amount of pigment applied as the casein is increased. This variable is of the same magnitude for all of the pigments, and any differences between the pigments for given casein contents are valid. Any increase in opacity gained by virtue of reducing the casein content is not to be confused with the actual opacity of a given pigment.

INK RECEPTIVITY

The ink receptivity of coated papers is a function of the degree of sizing as well as the nature of the pigment or pigment blend employed. We have, accordingly, plotted the ink receptivity of coated papers prepared from each of the pigments against the wax test. This relation is shown in Fig. 4, and it is evi-

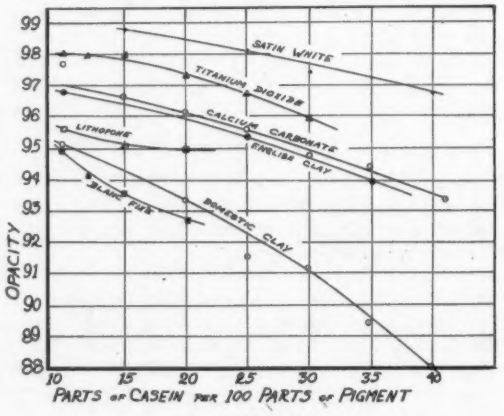

FIG. 3.
Opacity of Coated Papers Prepared from Various Pigments

dent that calcium carbonate and satin white are more receptive to ink than are the remaining pigments. Aside from the fact that some pigments are more receptive than others, the receptivity is almost a linear relation of the degree of sizing for all of the pigments, being inversely related to the wax test.

Blends of Calcium Carbonate With Other Pigments

In the preparation of coated papers from clay, it is usually necessary to add some brightening agent, such as satin white, calcium carbonate, or titanium dioxide. Such a procedure may be termed a blending of the pigments. A familiar example of extending pigments is the addition of calcium sulphate or blanc fixé to a more expensive material such as titanium dioxide. The extenders commonly used are those which will not have a great tendency to lower the properties of the pigment being extended. However, to the paper coater these terms are synonymous, since he is interested only in a mixture of pigments which will produce a finished sheet possessing certain characteristics.

In accordance with this purpose, we have prepared blends of calcium carbonate with varying amounts of

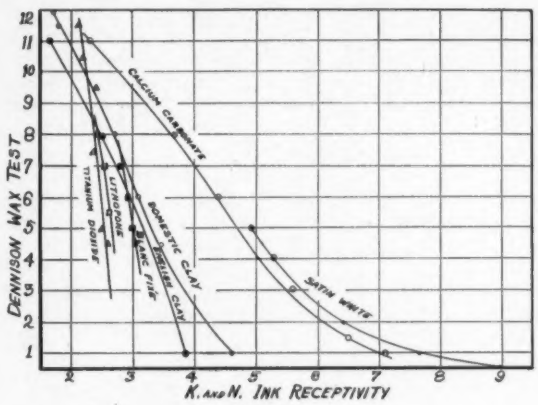

FIG. 4.
Ink Receptivity of Coated Papers Prepared from Various Pigments

titanium dioxide, clay, lithopone, satin white, and blanc fixé. The coated papers prepared from these blends were all sized to the same degree (4 to 5 wax pick) regardless of the amount of casein required.

BRIGHTNESS

The brightness values of the finished papers are given in Fig. 5. Those coated papers possessing the

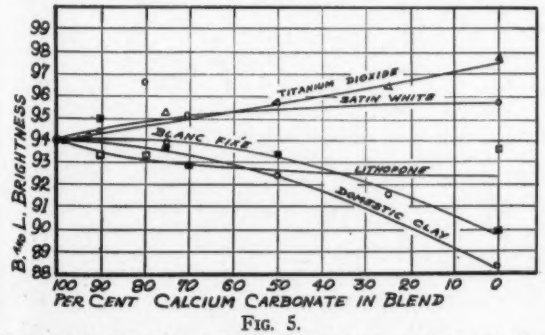

FIG. 5.
Brightness of Coated Papers Prepared from Calcium Carbonate Blended with Various other Pigments

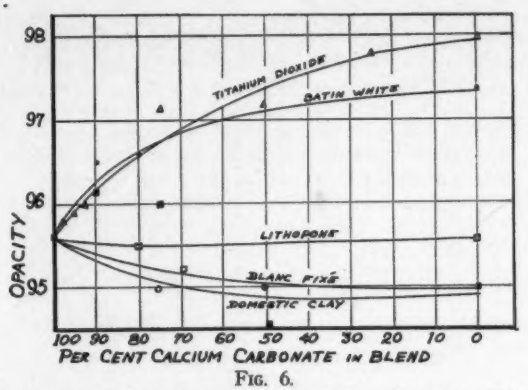

FIG. 6.
Opacity of Coated Papers Prepared from Calcium Carbonate Blended with Various other Pigments

highest brightness are prepared from blends of titanium dioxide and calcium carbonate, while the blends with satin white are also high. Clay, lithopone, and blanc fixé have a tendency to lower the brightness of coated papers when blended with calcium carbonate in increasing amounts.

It is obvious that calcium carbonate may be employed as a brightening agent for clay, blanc fixé, and, to some extent, lithopone. If it is essential that higher brightness values than are possible with calcium carbonate be attained, it is necessary to resort to satin white and titanium dioxide. As far as we know at the present time, the upper limit in brightness would be that of 100% titanium dioxide.

OPACITY

The opacities of coated papers prepared from the blended pigments are shown in Fig. 6. The relation bears a definite resemblance to that shown in brightness. Higher opacities are obtained with calcium carbonate blended with titanium dioxide or satin white, while clay and blanc fixé have a tendency to lower the opacity as they are employed in increasing amounts with calcium carbonate. Therefore, calcium carbonate may be employed to increase the opacity of clay and blanc fixé coatings up to a certain point, beyond which it would be essential to employ satin white and titanium dioxide.

INK RECEPTIVITY

The effect of various pigments blended with calcium carbonate on the ink receptivity of coated papers is given in Fig. 7. The highest values for ink receptivity are obtained with calcium carbonate blended with satin white. The remaining pigments lower the

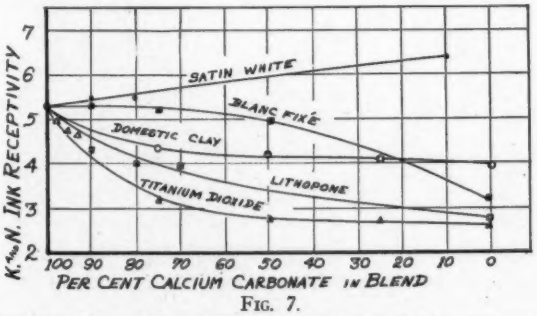

FIG. 7.
Ink Receptivity of Coated Papers Prepared from Calcium Carbonate Blended with Various other Pigments

ink receptivity when blended in increasing amounts with calcium carbonate. Satin white and calcium carbonate may be incorporated into most coatings for the purpose of increasing the ink receptivity.

Gloss

The gloss values of coated papers prepared from various pigments blended with calcium carbonate are given in Fig. 8. Satin white, when blended with calcium carbonate in small amounts, shows a decided improvement in gloss. Clay and titanium dioxide also show an improvement, but it is not so pronounced as with satin white, and larger amounts of these materials are required. Lithopone and blanc fixé show only slight improvements in the gloss values when incorporated with calcium carbonate.

Smoothness

In Fig. 9 we have plotted the smoothness values of the finished coated papers prepared from various pigments blended with calcium carbonate. The results indicate that satin white and lithopone, when blended with calcium carbonate in increasing amounts, will improve the smoothness. Titanium dioxide has little effect on this value, while blanc fixé and clay show a tendency to lower the smoothness. Calcium carbonate is, therefore, a suitable pigment to incorporate with clay, blanc fixé, and titanium dioxide for the purpose of obtaining desirable smoothness values.

High smoothness values are essential to modern printing procedures—even more so than gloss. It is not surprising, therefore, that we are hearing more and more about dull finish papers. In the past it has been generally true that coated papers having a high smoothness value also, by necessity, had a high gloss.

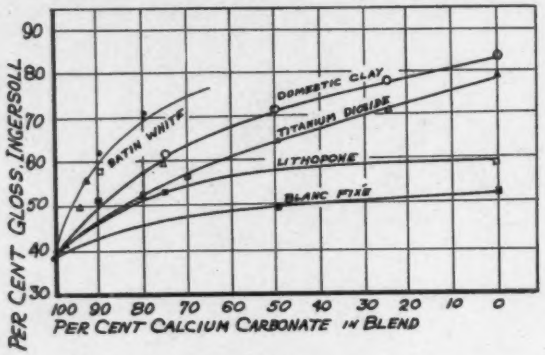

Fig. 8.
Finish of Coated Papers Prepared from Calcium Carbonate Blended with Various other Pigments.

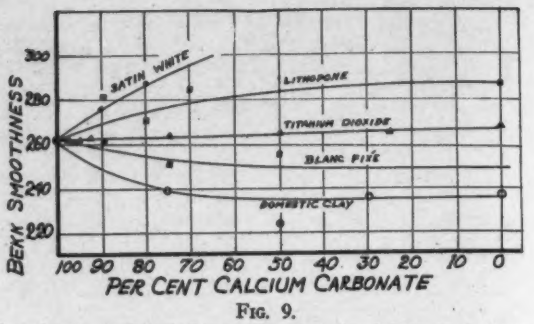

Fig. 9.
Smoothness of Coated Papers Prepared from Calcium Carbonate Blended with Various other Pigments

Definite attempts, which have netted considerable success, have been made to develop dull finish coated papers with a high smoothness. The findings shown in Figs. 8 and 9 would indicate that calcium carbonate lends itself to the production of a dull finish coated paper with a high smoothness when used alone or in reasonably large amounts with other pigments.

Conclusions

Fundamentally, each pigment available to the producer of coated paper may be employed for a definite purpose. Our modern methods are founded upon blending certain pigments for the purpose of imparting the desired properties to the finished paper. While almost an inconceivable number of combinations may be prepared from a few individual pigments, the problem of arriving at the ones suitable for a given purpose is relatively simple. Once the specific use or purpose of each pigment is established, an orderly arrangement may be set up which will enable a more systematic blending of the individual pigments.

The findings reported herein indicate that the pigments mentioned may be classed according to the purposes they serve best. The arrangement is as follows:

PROPERTY DESIRED IN FINISHED SHEET	MOST DESIRABLE PIGMENTS TO EMPLOY
Improved brightness	Titanium dioxide, satin white, calcium carbonate
Improved opacity	Titanium dioxide, satin white, calcium corbonate
Improved ink receptivity	Calcium carbonate, satin white
Improved gloss	Satin white, clay, titanium dioxide
Improved Smoothness	Satin white, lithopone, titanium dioxide, calcium carbonate
Dull finish	Calcium carbonate, blanc fixé

By following this arrangement, the preparation of a pigment blend for almost any type and grade of coated paper is a relatively simple procedure.

Chipper Knives*

By C. P. Robinson[1]

Abstract

This paper gives a brief history of early chip conversion and the manufacture, care, and grinding of chipper knives, and recommends proper recording of chipper knife performance. It also gives an outline of the general improvement in the construction, performance and economies effected in the use of special alloy steel knives recently developed.

Chipper knives were placed in service shortly after the erection of the first chemical pulp mills. The first sulphite mill was built by C. D. Ekman at Bergvik, Sweden in 1874. This mill had a capacity of 485 tons yearly. Mitscherlich erected a sulphite mill in Germany in 1880, where he produced a strong pulp by long cooking at low temperature and pressure.

* Presented at the Annual Convention of the American Pulp and Paper Mill Superintendents Association, Cincinnati, Ohio, June 18-20, 1940.

[1] Member TAPPI; special representative, Heppenstall Company, Pittsburgh, Pa. and Kidder Press Co., Inc., Dover, N. H.

Early Patents

On August 19, 1853, Charles Watt and Hugh Burgess received a patent in England covering the pulping and disintegrating of shavings of wood and other similar vegetable matter for making paper. Mr. Burgess, one of the patentees, was the manager of the American Wood Paper Company's works at Royersford, Pa., where five tons of soda pulp were made daily, and later this company built a new plant, producing the same grade, having a capacity of 15 tons daily, which was located at Manayunk, Pa., and was leased to Jessup & Moore and Martin Nixon.

The wood was brought to the plant as cordwood of 5-foot lengths. The bark was stripped off by hand and the wood was cut into slices about one-half inch in thickness by a cutter or chopper, a machine looking like a feed-cutter on a large scale. Four steel knives, from 8 to 10 inches wide and from 12 to 15 inches long were fastened in a slightly inclined position to a solid cast iron disk of about 5 to 7 feet in diameter, revolving at a high speed, chopping these thin slices of wood across the grain. The wood was fed to the machine through a trough 10 to 12 inches in width which was placed on sufficient angle to permit the wood to slide down towards the disk. A piston or pusher, which was propelled by a rack, pushed the wood steadily forward until it was entirely cut up. The piston then returned to its original position and the operation was repeated. About 40 cords of wood were cut daily in this plant.

In 1886 the Fletcher Paper Company, Alpena, Mich., erected the first sulphite mill in this country. At the beginning, disks three-quarter inch thick were produced by gang saws and were packed into the digester without being chipped. The first cookings required 127 hours. The first chippers were installed in this plant between 1893 and 1895, and were two-knife affairs without a bed knife. On the Pacific coast, at about the same time, chippers were built with knives set in the face of a heavy pulley, which had the advantage of allowing the knives to clear the bed knife exactly. These chippers, however, did not operate successfully, because the centrifugal force held the chips inside the pulley rim, causing the chipper to pack and clog.

One of the first chippers of foreign design was installed at the Whalen Brothers' plant at Woodfibre, B. C., now operated by the British Columbia Pulp & Paper Co., Ltd. When this plant started operations, the wood was delivered to the mill in the form of cants 12 inches square by 60 feet long. The chips produced were about 2 inches long, the length of the feed.

Manufacture of Chipper Knives

In the manufacture of knives first consideration must be given to proper selection of the steel that goes into them. The steel should be chemically pure and inherent in its physical qualities. The smaller the quantities of sulphur, phosphorus, oxygen, and silicon present in the form of silicates, etc., the purer is the steel; the fewer the differences in composition and structural or physical makeup from one piece to another of the same chemical specification, and from one lot to another, the more uniform is the steel; and ultimately, the nearer a steel conforms to these ideals the greater is its degree of quality. The best alloys are required to insure best results and experience has proven that small capacity furnaces offer greater ease in accurately controlling any attending variables of steel melting that influence the quality and uniformity of steel.

The ingots from small furnace capacity are cast relatively small in size, thus offering a minimum tendency toward chemical segregation, both radially and axially, and thereby resulting in a chemically uniform and physically homogeneous and dense steel.

The induction process is essentially one of electric crucible melting, refining, and alloying of pure metallic substances in an ideal nonoxygenous and nonsulphurous atmosphere. The chemical composition can be duplicated in other processes, but the quality is distinctly different, since other processes are subject to relatively more variables in melting and refining. With this more practical and scientific control over the easily oxidized elements, the induction process offers less variation in alloying constituents, from heat to heat from the same chemical specifications, than is possible with any other commercial steel melting process.

Modern heating and forging, heat treating, and machining facilities are essential for proper fabrication of the steel into a first-class product.

Chipper knives composed of alloys which give high carbide, wear-resistant and strength qualities, properly fabricated, have given unusual performance, as they combine hardness with toughness, which are essential for successful chipper knife operation.

Experiments have been conducted by some mills in stelliting chipper knife blades; however, after several grindings the stelliting was completely removed and little if any extra service was derived. Some mills claim reasonable success in stelliting chipper bed knives after they have worn round.

Care of Chipper Knives

The care of chipper knives is important. When not in use they should be stored in a dry place in such a manner that they are properly protected against rust, and the knife blades against being nicked.

Installation

In placing the knives on the chipper disk, care should be taken to see that the tightening of the bolts is gradual, and that too much strain is not placed on any particular bolt hole, as otherwise the knife may crack or break after it is put into operation.

The heads of the chipper knife bolts should be flush with the surface of the knife and should not protrude, otherwise sawdust and torn wood will result.

In cutting short chips the clearance angle between the stick and the chipper knife is important as the tendency for the knife to heat is increased. This is one reason for the development of a new chipper disk with slots running through the disk at about a 45-degree angle, into which the knives are fastened. These slots afford protection for the knives to some extent.

Grinding

The grinding procedure is also important. Some of the trouble with chipper-knife performance can be traced to burning on the grinder due to dirty emery wheels which have not been cleaned by an

emery wheel dresser; and because the operator of the grinder has been careless in setting up the knives on the machine, resulting in irregular bevel.

A spray of water should be played on the emery wheel at all times where it contacts the knife blade. The bevel of the blade must be straight—not concave nor convex. The grinding should not be rushed. Grinding burrs should be removed with a hand oil stone. For best results knives should be honed in a circular motion until all the fine irregularities are completely removed from the cutting edge. The under side of the knives should also be honed to remove the burrs. An extremely light grade of oil should be used as a lubricant in connection with this operation.

Should be Watched for Blue Spots

The chipping edge should be watched for glossy, glazed, or blue spots, as such spots indicate burning. Knives which have been burned in grinding cannot be reclaimed. A soft, fine-grain emery wheel should be used—hard wheels cause burning. Some plants, which do not permit the cutting edges of the knives to become badly worn, touch up the blades with a hand oil stone as the stone gives a more uniform smoothing to the cutting edges than is possible with the electric portable grinder or the hand file.

The portable grinder and the hand file touch up the knife blades quickly while on the chipper disk and, when expertly handled, do a good job. Improper grinding or filing weakens the cutting edges and causes them to crumble. Often the grinder or filer unintentionally decreases the cutting angle considerably beyond the original degree of the blade, and it is necessary to strain-relieve and regrind these knives, before they are in proper condition for chipping.

In general, a check on the sawdust content in the chips should be the best guide as to the frequency of grinding.

Bevel

Sometimes the bevel of chipper knives causes some trouble. The degree and style of the bevel is subject to some controversy, as some mills prefer a double, while others prefer a single-bevel blade.

The mills using the double-bevel blades claim better quality and more uniform chips and reduction in the quantity of sawdust and oversized chips, because the double bevel does not crush the wood as much as the single-bevel blades, and the chips are less likely to fly. They also claim reduction in horsepower and vibration and longer life for the knives.

The mills using single-bevel knives claim they break up the chips much better and permit of better penetration in cooking. A bevel under 37 degrees weakens the chipping edge of the blade and is not recommended. A 45-degree bevel is strong but is objectionable to many mills for various reasons, principally because of the extra power required.

The edge of the chipper bed knife should be kept in proper condition as a dull knife will cause the sticks to bounce very badly and any movement of the stick, other than straight feed, is an indication that good wood is being destroyed.

Laminated and Solid Knives

Originally the laminated or plated knives were used and this type is still used in some mills. The principal objection to this type is the possibility of the weld breaking between the cutting steel and the soft backing, while the chipper is in operation. This kind of failure has resulted in some serious accidents. Many mills prefer the solid knives which are given the proper temper on the cutting side and then softened up in the back. When properly fabricated the solid knives are more rugged and less likely to crack or break.

Drilling

Knives which are drilled with round or oval countersunk bolt holes have been found to be the strongest and least likely to break. Oblong holes or slots which have square corners have a tendency to crack at the corners.

Performance Records

In order to determine the efficiency of chipper knives, proper records should be kept as to the life, length of service and the production between grinds, time and estimated production loss in changing knives, number of regrinds per knife, and particular record should be made of any unusual circumstances that would tend to shorten the life of a particular knife or knives, such as damage from spikes, broken bolts, etc. Any economies which might be effected through change in bevel, etc., could also be recorded. As chip classification is so strongly related to chipper-knife performance, this record should also show the kind and condition of the wood chipped, the quantity of good chips, as well as the quantity of bruised oversized chips and the sawdust waste.

Improvements

Gradual improvements have been made in chipping machines which have necessitated improvements in the style and performance of chipper knives. The general demand is for greater production of cleaner and more uniform chips at lower operating costs. The chipping of various types of hardwoods, and the chipping of "cat-face" pine in the south have increased the work of chipper knives. In order to meet these increased demands, special alloy steel chipper knives of varied treatments and analyses have been developed. These knives command a higher price, but the economies they effect far offset the higher initial cost.

Under most favorable conditions these special knives have given over ten times the service between grinds than the plain carbon knives. In the majority of cases they are giving four to six times the service as compared with the plain carbon knives, and it is not necessary to grind away as much of the steel in bringing the knife blade back to a keen cutting edge, thereby increasing the life of the knife by adding to the number of grinds.

Advantages

Due to the fact that these special knives maintain their keen cutting edges much longer, the pulp mills have experienced appreciable savings in the quantity of bruised and oversized chips and sawdust waste, as well as better and more uniform chips, resulting in a satisfactory increase in the yield as well as a noticeable improvement in the quality of the pulp.

Many mills which have previously had definite fixed cycles for operating chipper knives have been able to increase the cycle several times between regrinds, resulting in increased production with decreased overhead costs.

Regulators for Boilers and Paper Machines*

By A. C. Wenzel[1]

Abstract

In a simple manner, the elements of regulation, their application to steam boilers and their application to certain functions in the operation of a power plant and mill where machine regulation, or so-called automatic control, may be applied to advantage are described. The paper embraces the various common types of regulators in use in power plants, as well as on various paper mill machinery. All of the fundamentals of the principal types of regulators are covered and their functions described in a simple manner. No attempt is made to formulate or theorize on the operation of the various types of control units.

In general there are two types of regulators; namely, the positioning regulator and the measuring regulator. All regulators or machine controllers come under either one of these two classifications. There are many so-called regulators on the market which are not truly regulators. These may be automatic switches for starting or stopping certain equipment, when certain pressures are reached or certain flows are reached; but these devices in the true sense of the word are not regulators and, therefore, will not be covered in this discussion. The discussion will be limited entirely to the two fundamental types of true regulators.

Positioning Regulators

The classification of positioning regulator covers any regulator, damper, valve actuating device, in which the damper, valve, or other controlled equipment takes a definite position when a certain predetermined pressure is applied to the receiving or pressure sensitive diaphragm. Thus, for every received pressure, the regulator moves the damper, or valve, to a certain definite position. This position may be determined by means of a spring which is opposed by the measuring diaphragm, or by a cam which may be cut in some predetermined shape to locate the damper or valve in the desired position for a given received pressure, or by a combination of diaphragm, spring, and cam to obtain the desired resultant position with the application of a definite predetermined pressure.

Under this classification we may include diaphram-operated valves, in which the diaphragm is opposed by a spring, when these diaphragm-operated valves are used to provide a certain predetermined valve opening when a given pressure is applied to the diaphragm. These diaphragm-operated valves, however, may not be classified under positioning regulators when they are used to control a pressure, such as a diaphragm-operated steam pressure valve on which the steam pressure itself is directly impressed upon the operating diaphragm. In this case, the diaphragm-operated valves fit in the second classification or *measuring* regulator classification.

A positioning regulator which is frequently used in conjunction with combustion control systems is shown in Fig. 1. In this device a variable pressure is impressed upon the diaphragm *A* which is opposed by spring *B*. In the system which will later be described, the master loading pressure, or pressure applied to the diaphragm, may vary anywhere between zero inches of mercury and 10 inches of mercury pressure. Thus, for any pressure between zero and 10 inches of mercury, the diaphragm will take a proportional position as determined by the compression of the opposing spring. Thus, for a high pressure, the spring will be compressed a great amount and the diaphragm will move a considerable distance, while for a smaller pressure the diaphragm will not move so far.

This movement of the diaphragm is transmitted through linkage *C* to the pilot valve *D*. The opening of this pilot valve will permit air to be supplied through space *E* above the piston of the power cylinder. The power cylinder will then move in a downward direction, causing roller *F* to travel along cam *G*. Cam *G* is pivoted about point *H* and is held against roller *F* by cam contactor spring *I*. Thus, the power cylinder piston will travel in a downward direction until roller *F* has caused cam *G* to move to the left a sufficient amount to restore linkage *C* and pilot valve *D* to the balanced position. Therefore, it may readily be seen that the piston of the power cylinder will take a definite position for every pressure applied to diaphragm *A* as determined by the compression of spring *B* and the shape of cam *G*. The position of the power cylinder may be changed for a definite loading pressure merely by reshaping cam *G*.

This combination of units—the diaphragm, spring, linkage, pilot valve, and power cylinder—constitutes

* Presented at the Annual Convention of the American Pulp and Paper Mill Superintendents Association, Cincinnati, Ohio, June 18-20, 1940.

[1] Chief Contract Engineer, Republic Flow Meters Co., Chicago, Ill.

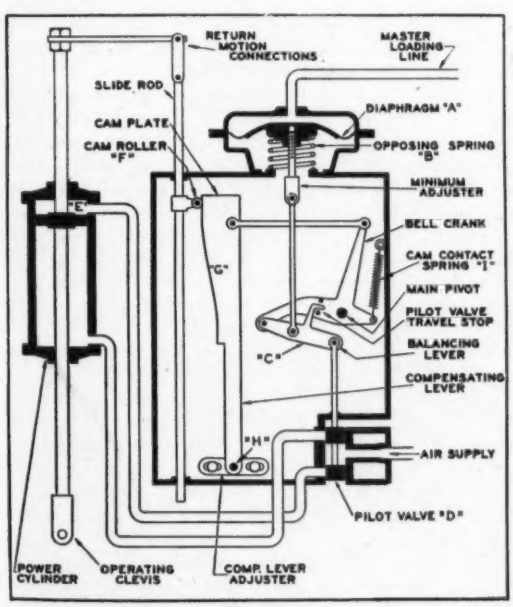

FIG. 1.
Positioning Regulator

a complete positioning regulator which can be used to position a damper or coal feeder or valve in proportion to a loading pressure received from some other controller or regulator. This type of regulator constitutes a combination of devices, the response of which is instantaneous. This type of regulator requires no special stabilizing element, since it is stable within itself, due to the peculiar construction of the device.

Measuring Regulators

In general there are three types of measuring regulators. These may be classified as: (1) characteristic or droop type; (2) reset type, and (3) isochronous type, meaning a regulator without characteristics.

Characteristic or Droop Type Regulators

Common examples of regulators of this type are the common spring-loaded pressure relief valve, and the diaphragm-operated valve which may be used for regulating upstream or downstream steam pressure directly to the diaphragm of the valve, where it is opposed by a compression spring. In this type of regulator, an increase in downstream steam pressure —for instance, in the case where the valve is used as a pressure reducing valve—will cause a closing of the valve, while a drop in downstream steam pressure will cause an opening of the valve.

For example, a valve which will be in the tight closed position at 210 lb. per sq. in. gage pressure and will be in the wide open position at 200 lb. per sq. in. gage pressure. For any pressure between 210 and 200 lb. per sq. in. gage, the valve will be in an intermediate position as determined by the scale of the compression spring used in the valve mechanism.

This represents the simplest characteristic type of regulator. It is essentially this type of regulator which is used as a part of the master control mechanism of the control system about to be described. Figure 2 shows a characteristic or droop type of regulator as used in a master control system. This regulator is designed to send an air loading pressure to various combustion control units in inverse proportion to the boiler plant or steam header pressure. The steam header pressure is applied under sylphon bellows *A*, and the force of the steam pressure against the sylphon is transmitted to weighbeam *B*, which is opposed by loading spring *C*. Weighbeam *B* controls air bleed *D*, which in turn controls the pressure in chamber E, as well as the pressure under diaphragm F. Thus, the operation of this unit is as follows:

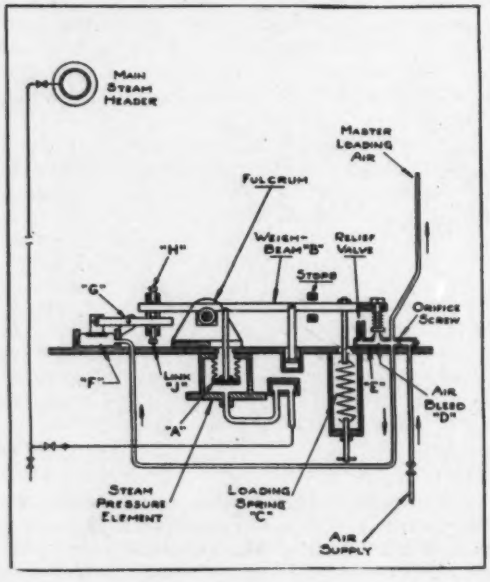

Fig. 2.
Characteristic or Droop Type

Let us assume that the force exerted by bellows *A* is exactly balanced by loading spring *C*, and air bleed *D* is open so that there is zero pressure in chamber *E*. *A* drop in steam pressure under bellows *A* will cause spring *C* to move weighbeam *B* so that air bleed *D* will close and build a pressure in chamber *E*. The pressure in this chamber is supplied through an orifice screw, (a screw through which a small hole has been drilled) from the main air supply line. This main air supply pressure is maintained at 5 lb. per sq. in. by means of a small diaphragm-operated pressure regulator. This increase in pressure in chamber *E* is then transmitted to diaphragm *F* which, through linkage *G*, causes a resultant downward force at point *H*, and this downward force at point *H* will then be proportional to the drop in steam pressure. Thus, for the small drop in steam pressure which we have under consideration, there will be a proportionate increase in force at point *H* which will again put the weighbeam *B* in balance.

However, now the unit will be in balance for a lower steam pressure under *A* than we had originally. Thus, the resultant pressure in diaphragm chamber *E* is transmitted through the master air loading line to the various combustion control regulators which will cause opening of dampers and increasing of fuel feed in proportion to the drop in steam pressure under sylphon *A*.

This master air loading pressure which is sent from this characteristic regulator, or steam pressure element, as it is called, will vary from zero inches of mercury to 10 inches of mercury.

Reset Type of Regulator

Practically all of the instrument-type of controllers which are equipped with compensating devices provided to cancel the characteristic come under this classification. This is true of the various temperature controllers, as well as instrument-type of flow and pressure controllers. In these various instruments, which are usually air-operated, the reset device may be a combination of small bellows, or hydrons, which operate shifting linkages and create balancing forces for obtaining constant pressure, flow, or temperature control at all rates of operation. In the system we are about to describe, we have a reset-type of regulator in the master control element which is partially shown in Fig. 2. In Fig. 3 we have shown the complete master pressure element as supplied with the combustion control system.

We have followed through the operation of the unit shown in Fig. 2 and have found this portion of the device to be a true characteristic regulator. In order to make this same unit function as a reset-type of regulator, it is merely necessary to introduce an additional diaphragm *K* and a time delay, or pressure reset unit *L*.

To follow through the operation of this type of unit, let us assume again that the force created by sylphon *A* is exactly balanced by spring *C*, and weighbeam *B* is holding the air bleed *D* open so that

there is zero pressure in chamber *E*. We now have a drop in steam pressure which causes spring *C* to close air bleed *D*, building up a pressure in *E* which is immediately transmitted to diaphragm *F*. This force created by the pressure under diaphragm *F* exerts a resultant downward force at point *H* on weighbeam *B*, and the unit comes to rest at the point where the pressure created in chamber *E* is proportional to the drop in steam pressure under sylphon *A*.

In order to more clearly understand the functioning of the reset device, see Fig. 4. We have drawn the base characteristic and the point at which the description was started; namely, at zero inches of mercury, the steam pressure was 210 pounds. We have designated this as point (1) on curve shown in Fig. 4. Then a given drop in steam pressure to point (2) causes a certain increase in air pressure under diaphragm *F* of Fig. 3. This increase in air pressure under diaphragm *F* then puts the weighbeam *B* in balance for the drop in steam pressure which occurred from point (1) to point (2) of Fig. 4.

The purpose of the reset device is to maintain approximately constant steam pressure at 210 pounds in the case which we have chosen, for all master loading pressures from zero to 10 inches in mercury. The reset device consists of a glycerin chamber with a bleed valve and a balancing diaphragm *K* arranged so that the pressure created in chamber *E* of Fig. 3, as well as under diaphragm F, is also conducted to the upper surface of the glycerin in the pressure reset device L. Thus the pressure is slowly transmitted by means of the glycerin and reset timing bleed valve, which is designated as *M*, onto diaphragm *K*. The drop in steam pressure to point (2) in Fig. 4 has created 3 inches of mercury loading pressure under diaphragm *F*. This 3 inch pressure is then transmitted through the glycerin to diaphragm *K*, which acts in a manner similar to a drop in steam pressure under sylphon *A*. The slow increase in pressure on diaphragm *K* causes the weighbeam *B* to come to balance at a new point (3), which is back on the constant pressure line of 210 lb. per sq. in. and is at a new mercury loading pressure of approximately 3½ inches. In this way, the reset device has carried us back to the constant steam pressure line, and we are now operating on a new characteristic parallel to the base characteristic of the unit. Therefore, a further decrease in steam pressure will take place from point (3) to point (4) on the new characteristic, and the compensator or reset device, will then reset slowly to point (5) and we are again back to the constant steam pressure line.

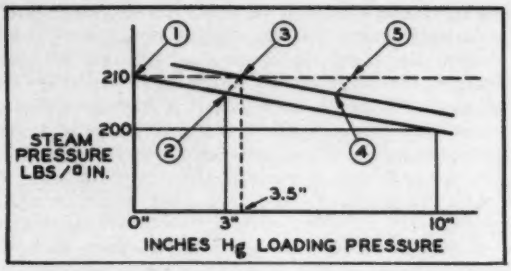

FIG. 4.

An increase in steam pressure will cause the device to function in the opposite direction so that the reverse action takes place.

This device, therefore, is used as the master control element in the control system about to be described. The fundamental regulator unit is of the characteristic type and, by means of a reset, or compensating mechanism, the characteristic regulator is converted to a reset type which will maintain constant steam pressure for all loading pressures to be sent to the control system to be described.

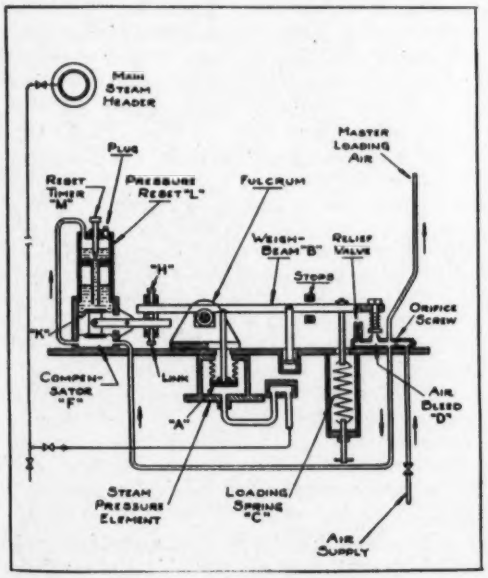

FIG. 3.
Master Pressure Element

ISOCHRONOUS REGULATOR, OR REGULATOR WITHOUT CHARACTERISTIC

This type of regulator is one in which there is always a true balance between the master loading pressure or force, and the controlled pressure or force. This regulator does not depend on characteristic of any type to make it stable, nor does its operation result in any droop or characteristic. It is a true measuring regulator and must consist of three elements. This is the type of regulator which will be used for measuring the air flow in the control system about to be described, and is also the type of regulator to be used for maintaining a constant furnace draft at all rates of combustion in the system which follows.

Three Elements of a True Regulator

The three elements which are the essentials of a good isochronous measuring regulator are: (a) measuring element, (b) power element, and (c) stabilizing element. Each unit will be described in detail to show the function which it must perform and its relation to the other elements of the machine.

MEASURING ELEMENT

The measuring element invariably consists of a weighbeam of some description, which is a horizontal lever balanced on a fulcrum. The forces to be controlled—namely, the master loading force and the controlled force—are then balanced upon this beam, and the beam is used to actuate a pilot valve, or mul-

tiplying valve which in turn creates a movement of the power element of the regulator.

When the regulator is in balance—i.e., when the master controlling force is in balance with the controlled force—the weighbeam is always in the horizontal position. An increase in the master loading force will cause the beam to tip in one direction, while an increase in controlled force will cause the beam to tip in the opposite direction. Thus, in Fig. 5, showing an air-operated regulator, weighbeam *A* must always be in the horizontal position when the unit is in balance.

The master loading pressure is transmitted to master loading diaphragm *B*, and the force created by this pressure acting on diaphragm *B* is balanced against the force created by the controlled pressure or differential acting on diaphragm *C* which is known as the regulating diaphragm. By means of a linkage, the force created on this diaphragm is also impressed upon weighbeam *A* and these forces are in balance about fulcrum *D*. Thus, for any given master loading pressure, the regulator cannot be in balance unless the forces on the weighbeam are in balance, and this can only be true when the force created by diaphragm *B* and its adjoining linkage exactly counteracts the force created by diaphragm *C* and its lever arm.

The type of measuring element, in which two forces are balanced on a single beam, is in itself unstable, and cannot be used directly as a regulating device. In the case of the system about to be described, this weighbeam is merely used for a balance of forces and is used to transmit the opening or closing movement to the multiplying valve in order to cause corresponding movements of the amplifier diaphragm *E* of Fig. 5.

Power Element

In the regulator shown in Fig. 5, air is supplied at not less than 40 pounds per square inch pressure

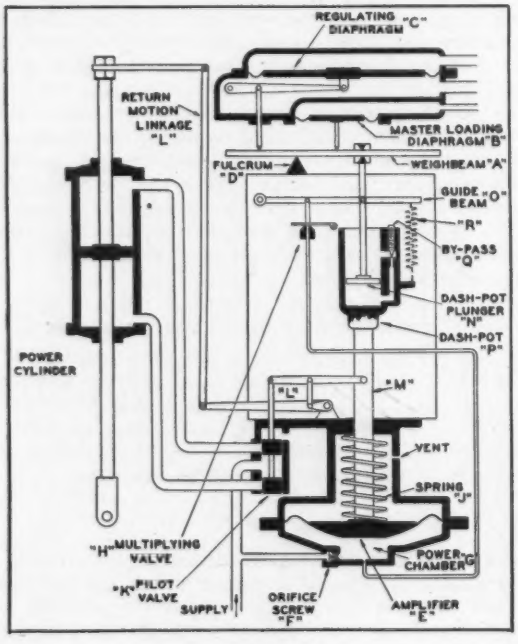

Fig. 5.
Pneumatic Regulator

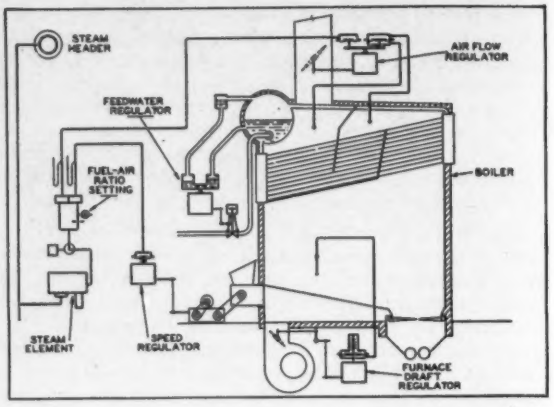

Fig. 6.
Control System

from the main air supply line to the pilot valve of the regulator and also to the orifice screw, part *F*. This is a small drilled hole which permits air to enter power chamber *G*. The pressure in power chamber *G* is then controlled by opening or closing multiplying valve *H*. Thus, when the flapper which covers the multiplying valve *H* is in the tight closed position, the amplifier E will be in the maximum upward position, and when this flapper uncovers multiplying valve *H* completely, the amplifier will be in the bottom position. The amplifier diaphragm is opposed by spring *J* so that the downward movement of the amplifier is created by the spring, while the upward movement is created by pressure under the diaphragm.

In order to cause the amplifier to come to rest in any intermediate position between top and bottom, it is merely necessary to place the flapper over the multiplying valve in such a position that it bleeds out only sufficient air from the multiplying valve to create the required pressure under amplifier *E* ie., the pressure in power chamber *G* in order to overcome the force of the spring which is required to keep the amplifier *E* in the desired position. The flapper over multiplying valve *H* consists of a phosphor bronze spring and its movement over multiplying valve *H* is controlled by the movement of the weighbeam of the measuring element.

In order that large dampers and valves may be moved, it is necessary to introduce a still more powerful unit in the form of a power cylinder. This power cylinder is operated by means of a pilot valve K. In order to keep the movement of the power cylinder in exact step with the movement of the amplifier, it is necessary to introduce return motion linkage *L*. Thus an upward movement of the amplifier E causes an upward movement of amplifier piston rod *M*. This upward movement of piston rod *M* causes a movement of the pilot valve which admits air to the lower end of the power cylinder. As soon as the power cylinder begins to move, its movement is transmitted through the return motion linkage *L*, thus resetting the pilot valve in the neutral position when the power cylinder has reached a position proportional to the movement of amplifier piston *M*.

Thus far, the units of the regulator which we have described are in themselves unstable and a third element must be provided which is called a stabilizing element.

Stabilizing Element

In order to prevent hunting and overtravel of the two units which have been described, it is necessary to tie them together with a third device known as a stabilizing element or dashpot.

Figure 5 shows the arrangement of this dashpot with its dashpot plunger. This dashpot is provided to control the speed of movement of the power portion, or amplifier, of the control unit. The dashpot plunger *N* is suspended from the giude beam *O*, which in turn, is susupended from weighbeam *A*. Thus, any force on the dashpot plunger is transmitted directly to weighbeam *A*. The dashpot *P* is mounted on the upper end of the amplifier piston rod M. The dashpot is filled with an oil of suitable viscosity, and the flow of oil around piston *N* is controlled by the bypass needle valve Q. This dashpot and its piston, or plunger, then constitute the complete stabilizing element of the regulator.

Let us assume that the weighbeam *A* is in balance, and there is an increase in the master loading pressure on diaphragm *B*. This causes the weighbeam to tip downward to the right, closing off the multiplying valve port *H*. This builds up a higher pressure in power chamber *G*, causing amplifier *E* to move upward. This upward movement causes an upward movement of dashpot *P* and an immediate reaction against dashpot plunger *N*. The reaction of this plunger is then transmitted to weighbeam *A* and causes the cover spring over multiplying valve *H* to open slightly, thus slowing down the movement of the regulator. The reaction under dashpot plunger *N* can be controlled by bypass *Q*, so that if it is desired to make the regulator move rapidly, the bypass *Q* is opened relatively wide; while if it is desired to make the regulator movement slow, the bypass needle valve *Q* is kept in a comparatively closed position.

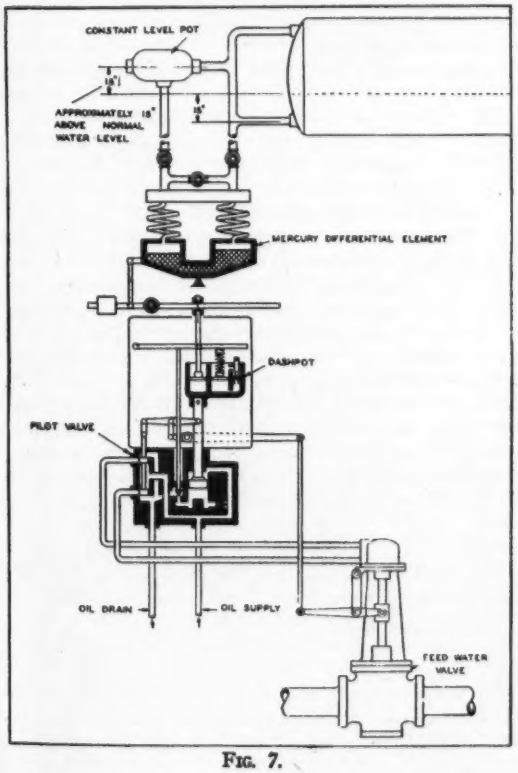

Fig. 7.

Thus the speed of movement of the regulator may, in all cases, be accommodated to the time delay in the controlled system. This time delay may be considered as the time elapsed from the time that the master loading pressure on diaphragm *B* changes until the regulated pressure *C* has changed and come to rest for the new load. As previously explained, a movement of the piston *M* causes a corresponding change in position of the power cylinder, which in turn moves the valve, or damper, controlling the pressure on regulating diaphragm *C*. This regulator is not only isochronous (meaning without characteristic), but is also aperiodic (meaning without oscillation or hunt).

Now, in order to convert this type of regulator into an aperiodic characteristic regulator, it is merely necessary to introduce a spring of the desired scale between guide beam *O* and dashpot *P*. This spring is designated as part *R* in Fig. 5. Thus, if the peculiar demands of the particular job in hand require a droop or characteristic in the controlled pressure, this can easily be obtained by the addition of spring *R*. But where a true isochronous regulator is required, this spring is omitted.

Definitions

In connection with this discussion of regulating equipment, it might be well to outline a few of the definitions and terms which are frequently used, and often misused, in discussions of regulators. Five terms commonly used in connection with regulators are: (a) sensitivity, (b) speed, (c) stability, (d) power, and (e) characteristic or droop (throttling range).

Sensitivity

This is the amount of change in the controlled quantity required to affect the regulator. This is a measure of its sensitivity. For close accurate regulation a regulator must be sensitive. It must detect and immediately respond to the slighest deviation of the controlled quantity from the predetermined setting. Obviously, a regulator with a maximum sensitivity of 1 pound per square inch will not respond as quickly as a regulator sensitive to changes of 0.1 of 1 pound per square inch. Therefore, the more sensitive the regulator, the shorter will be the interval between the time the pressure begins to change and the time the regulator responds to this change. The response of a highly sensitive regulator will be practically instantaneous.

Sensitivity, therefore, is a function of the starting friction—i.e., the force which must be overcome to set the regulator in motion. Thus, all measuring elements, which are the essential part of a regulator and which govern its sensitivity, must be as free from friction or starting resistance as possible. This term of sensitivity is often confused with characteristic or throttling range, and some of the control manufacturers producing instrument types of controllers of the characteristic type, often refer to the droop or throttling range as the sensitivity of the unit. This is entirely incorrect, since sensitivity and characteristic or droop are not related in any way.

Speed

Speed refers to the rapidity with which the regulator operates the controlled device. Any time required

to adjust the controlled device, after the measuring element detects the variation in the controlled quantity, will permit the controlled quantity to deviate still farther from normal. Therefore, in order to reduce the time lag of the system to a minimum, a regulator must be fast enough to follow the fastest load fluctuation. Consequently, speed of operation is a very essential part of any regulator. Speed is usually defined as the time required for the regulator to make a full stroke from the closed to the open position, or *vice versa*, with a given deviation or deflection of the measuring element.

Stability

Stability refers to the ability of a regulator to maintain the controlled quantity at a desired value without producing rhythmic or cyclic variations caused by the time lag in the controlled system, resulting from storage or inertia. Storage, or inertia, are usually fixed properties that cannot be eliminated from the system. Therefore, to nullify their effects and prevent the hunting rhythm from starting, the regulator must be equipped with some element that will provide the correcting factor. The entire system will then be stabilized by the stability of the regulator.

In order to accomplish this, a device is needed that will allow the regulator to respond instantly to a change in the controlled quantity and at a rate of speed proportional to the deviation from the normal value. Such a device should cause the regulator to move the controlled device at a decelerating rate as the quantity approaches normal. This type of stabilizing element will eliminate hunting.

In many types of regulator on the market, this type of stabilizing element is not provided. Very often stability is maintained, or approached by merely making the regulator move very slowly. This type of regulator is not truly stabilized, since conditions may occur in the load fluctuations which will cause it to hunt slowly and thus produce a rhythmic cycle.

Again, stability has often been confused with characteristic. A true stabilizing element does not have any permanent characteristic which it introduces into the operation of the cycle. A true stabilizing element, such as the dashpot we have described, introduces no permanent droop or characteristic and can be adjusted so that the regulator can move as fast as the cycle of control will permit.

Power

A regulator must have sufficient power not only to operate the valve, damper, or other device it controls, but also to overcome any accidental friction, sticking, or abnormal momentary pressures that may occur in any part of the system. Insufficient power will cause failure in operation. It is for this reason that regulators are made with different sizes of power cylinders —the smaller sizes for small valves, and the larger sizes for large valves, dampers, and vanes. Power in excess of normal requirements is essential for safety, assuring absolute positive operation of the control device in an emergency. Excess power is a great advantage in a very sensitive regulator, because it assures the proper operation of the controlled device in response to the slightest change that the regulator is designed to effect.

A measure of work produced by a regulator is the force which the cylinder can produce, multiplied by the distance through which this force may travel. Thus, if a cylinder can produce 500 pounds force and move this through one foot of distance, the regulator is said to be able to produce 500 pounds-feet.[2] Thus, in specifying the power requirements necessary to move a given damper, these requirements should likewise be given in pounds-feet so that the control manufacturer may easily determine the correct size of power cylinder which he must use for moving this damper.

Characteristic or Droop (Throttling Range)

Characteristic or droop may well be defined as the change in controlled pressure, expressed as percentage, which will result from full closed to wide open position of the regulator. Relief valves, such as spring loaded safety valves, will have a rising characteristic, that is, they will begin to open at a low pressure and will be wide open at some higher pressure. Pressure reducing valves and regulators of that nature have a drooping characteristic—i.e., they will control for high pressure near the closed position of the valve and for lower pressure at wide open position of the valve. Characteristic, or droop, are synonymous with throttling range. The expression "throttling range" is one which is used very frequently in conjunction with instrument type of controllers.

Fundamentals of Boiler Control

Since it is the purpose of this paper to present the application of the various types of regulators to a complete coordinated system of control, we have chosen the control of steam boilers to show such a coordinated system. Therefore, it is appropriate at this time to outline some of the fundamental elements which must be controlled either by the operator by manual means or through a control system in order to maintain constant steam pressure and good combustion at all plant loads.

In the control of a steam boiler of the usual type of design, five primary elements must all be coordinated in order to obtain the desired condition of constant steam pressure at all loads, as well as good combustion conditions and constant feed water conditions, regardless of the load demand on the unit. The five elements are as follows:

(a) the steam header pressure must be maintained constant; (b) the rate of fuel feed must be controlled; (c) the supply of air for combustion must be controlled in proportion to the amount of fuel being fired; (d) the combustion chamber pressure must be controlled to prevent excess infiltration of air and also to prevent the flame from puffing out of the doors or inspection holes; and (e) the feed water level must be controlled and maintained relatively constant, since the constant level will assure a rate of feed water flow to the boiler in proportion to the quantity of steam being produced.

Methods of Burning Fuels

The methods by which these five fundamental elements are controlled depend largely on the me-

[2] In the rating of the power cylinders in pounds-feet, pounds-feet and foot-pounds are more or less interchangeable. Pounds-feet is usually recognized as the measure of torques required to turn a damper. On the other hand, if the order mentions only the torque required—i.e., the force acting at the end of a lever arm—there is no indication of the work which must be done unless the order also includes the angle through which the damper must be turned. Therefore, it is better to have the power required to move the damper expressed in pounds of force times the distance through which this force must be moved. This then eliminates the need for giving the angle through which the damper must be turned.

chanical equipment provided for furnishing forced and induced draft and also on the type of fuel and the firing equipment provided.

There are three fundamental methods of burning fuel. These are as follows: (a) fuel burned on a grate, such as an underfeed stoker, an overfeed stoker, or a chain grate stoker; (b) fuels burned in suspension, such as oil, gas, or pulverized coal; and (c) a combination of burning in suspension and burning on a grate, such as is provided by the spreader type of stoker.

Fuels Burned on a Grate: In boilers fired by underfeed and chain grate stokers, continuous feeding of the fuel and uniform distillation of the volatile matter in the presence of oxygen are the essential requisites for efficient and smokeless combustion. In view of the fact that on such stokers there is always a relatively large quantity of fuel on the grates, the rate of combustion and heat liberation, and consequently the response of the boiler to load changes, are temporarily dependent on the air supplied under the grates and are not affected by the rate of coal feed until an appreciable time has elapsed. However, to maintain uniformity of the fuel bed and to maintain continuous high efficiency and smokeless combustion, it is necessary to vary the stoker speed—i.e., the fuel feed—in direct proportion to the air supply.

Fuels Burned in Suspension—Such as Oil, Gas, and Pulverized Coal: In the case of fuels of this type, the fuel and air are injected into the furnace as a mixture and the fuel is burned in suspension instead of on a grate. In this type of firing there is no reserve supply of fuel in the furnace. Consequently a change in the rate of steam output from the boiler is produced primarily by a change in the amount of fuel supplied. However, since a deficiency of combustion air produces smoke, while an excess of air will affect efficiency of operation, the fuel and air inputs must be changed simultaneously in the correct proportions. Thus, in this system, it is very important to maintain the rate of fuel feed to the boiler and the rate of combustion air supply exactly proportional at all rates of combustion.

Spreader Type Stokers: On the spreader-type stoker, part of the coal burns in suspension as it enters the furnace, and the remainder burns in a thin active fire over the entire grate. Consequently the boiler responds primarily to a change in coal supply. The fuel bed condition is not an important factor. This type of firing has many of the characteristics of pulverized coal firing, necessitating the same close control of fuel-air ratio as the latter. Thus, in this case also, it is essential to keep the rate of coal feed and the rate of air for burning the coal exactly proportional at all rates of combustion.

Application of Various Types of Regulators to a Typical Combustion Control System on a Single Boiler

It is the purpose of this portion of this paper to show the application of the various types of regulators previously described to a typical boiler plant installation. In order to show all types of regulators previously described—i.e., the reset type, the positioning type, and the measuring type—we will take as an example a combustion control system for an underfeed stoker-fired water-tube boiler, provided with constant-speed motor-driven forced-draft fan and natural stack draft to carry away the waste gases. The arrangement of this equipment is shown in simple line diagram on Fig. 6

In this figure you will note that the steam pressure element is the unit which was described in Fig. 3. This master pressure element sends an air loading pressure to two mercury indicating gages, one of which is equipped with throttling orifice and bleed valve, and from these mercury indicating gage columns, air loading pressures are sent to the fuel feed regulator and to the air volume regulator respectively.

For the drive on the stoker, we have chosen a constant-speed motor with variable-speed transmission. The transmission is of such a design that a given position of the lever will result in a certain speed, and for every position of the lever there is a certain definite speed produced on the driven pulley. Thus, since the underfed stoker is a positive displacement device, the amount of coal which it supplies to the furnace is directly proportional to its speed. Therefore, for this application, it is perfectly satisfactory to use a positioning-type of regulator, since each position of the regulator produces a definite speed of the variable-speed transmission driven pulley which, in turn, produces a definite speed of the underfeed stoker ram. This regulator will then be the one described in Fig. 1, and the cam of the regulator will be cut so as to match the characteristic of the air volume regulator.

The air volume regulator will be exactly similar to that shown in Fig. 5, in which a master loading pressure is balanced against the differential draft loss across the last baffle of the boiler. This is a recognized gas flow measurement, since we are measuring the total products of combustion resulting from the burning of the coal on the grate. This regulator will control the boiler outlet damper to maintain the volume of waste gases in direct proportion to the amount of coal being supplied.

Then, in order to maintain constant furnace draft, that is, constant over-fire draft condition, a measuring type of regulator, similar to that shown in Fig. 5, will be used to control the discharge damper on the constant-speed forced-draft fan. This regulator will maintain the overfire draft at a constant value at all rates of combustion.

Thus, we have shown the application of the characteristic regulator with reset for the steam pressure element. We have shown the application of the positioning regulator to control the stoker speed, and we have shown the application of measuring regulators, which are of the isochronous type, and also of the aperiodic type, since they have no characteristic and are provided with stabilizing elements which will prevent them from hunting.

There is one more function of boiler operation which must be controlled, and that is the rate of water supply to the boiler. As previously stated, the level in the drum is an excellent and accepted controlling function of the water required by the boiler. We will apply a measuring-type regulator, equipped with a mercury differential element for operating the feed water supply valve to the boiler drum. The arrangement of this type of regulator is shown in Fig. 7, which indicates an oil-operated regulator with oil supply and drain instead of the air-operated measuring-type regulator which was previously described.

The power cylinder is mounted directly on the feed water valve; and the feed water valve piston rod is linked to the return motion of the regulator, so that

the feed water valve position corresponds at all times to the amplifier position of the regulator.

This type of feed water regulator is equipped with a special stabilizing element which incorporates a so-called Picard spring dashpot instead of the ordinary single-element type of dashpot. This type of stabilizing element is required because of the storage capacity of the boiler and its tubes and is necessary to obtain complete stability.

The measurement of feed water level is made by means of a mercury differential element, consisting essentially of a large U-tube mounted on a fulcrum. One leg of the U-tube receives pressure from the constant level pot in which a constant head is maintained on one side of the mercury differential element. The other leg of the mercury differential element is connected to the lower portion of the boiler drum and receives pressure in proportion to the level of water in the drum. Thus, any change in level in the drum causes a change in static head on the right-hand leg of the mercury differential element and causes the mercury to flow from one side to the other which unbalances the mercury differential element. The level, which it is desired to maintain, is controlled by the weight shown on the left-hand side of the weighbeam. Thus, if there is any deviation from the set level, the mercury will flow to one side or the other of the mercury differential element, causing the regulator to move the multiplying valve which, in turn, sets the power cylinder in motion. The stabilizing element will prevent hunting or overtravel of the unit.

We have covered the five essential control points on the boiler and have described how a full-coordinated, completely-stabilized combustion control system functions on a typical installation.

Control of Bark Burning Furnace

Let us consider the application of regulating equipment to an oilfired boiler equipped with a Hofft furnace. We will arrange this control equipment so that the burning of the bark in the Hofft furnace is controlled manually and the fuel-oil and the air for burning it are supplied to the boiler in proper quantities to maintain constant steam header pressure. This arrangement is shown in Fig. 8.

We will use a master controller which will consist of a reset type of regulator as previously described. This reset type of regulator will send air loading pressures to an oil volume regulator and an oil-air volume regulator for controlling forced air in proportion to the quantity of oil being burned. These two regulators will receive their master loading impulses from the reset regulator. Mercury indicating gages will be provided on the master controller for indicating the loading pressures to the oil regulator and the oil-air regulator of this group. In this case, each of these regulators will be of the measuring type in which a master loading pressure is balanced against a differential pressure, the differential pressure being a function of the quantity being controlled. That is, the differential pressure will be obtained from a measuring element located in the oil supply line in the case of the oil volume regulator, and in the forced air duct to the oil burners in the case of the air volume regulator. The forced air fan will be equipped with a constant pressure regulator which will maintain a constant forced air pressure in the common duct to the oil burners and also to the bark burning furnace. This constant pressure regulator will be of the measuring type in which a diaphragm measuring the pressure is balanced against a spring to maintain the desired constant pressure.

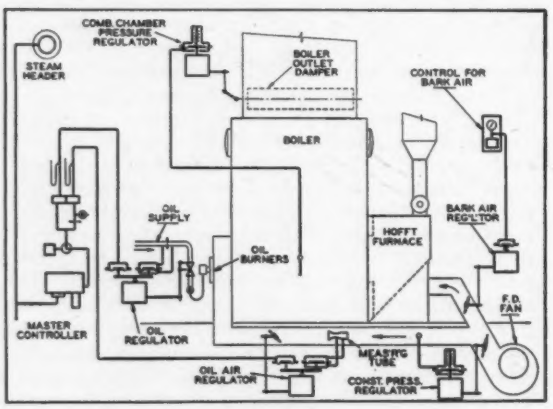

FIG. 8.
Control System for Oil and Bark Firing

The forced air supply to the bark burning furnace will be controlled by a positioning regulator which will receive a loading pressure from a small air pressure sending device equipped with pressure gage. By means of this air pressure sending device, the operator may send an air pressure to the positioning regulator which will in turn place the damper on the inlet to the bark burning furnace at any desired position. The boiler outlet damper will then be controlled by means of a combustion chamber pressure regulator. This will be of the measuring type, in which the force on a diaphragm created by the combustion chamber pressure is balanced against a spring by means of which the combustion chamber pressure can be set.

Thus, at all times, the combustion chamber pressure will be maintained constant regardless of the products of combustion being generated by the oil burners or by the Hofft furnace.

In the event that there should be a demand for more steam, the steam header pressure will tend to drop and the master controller will increase the air loading pressure to the oil volume regulator and to the oil-air volume regulator. These regulators will open in the correct proportion to supply measured quantities of air and oil to the burners. At the same time that the oil-air volume regulator acts to open the air damper to the oil burners, the pressure in the common air duct will tend to drop. Immediately the constant pressure regulator on the forced air fan will operate to maintain the common air duct pressure constant. Thus it will not be possible for the oil-air volume regulator to rob air from the bark burning furnace.

We have deemed it advisable to recommend a positioning regulator for the damper on the bark burning furnace. Another method of handling this application would be to put a measuring regulator on the damper to the bark burning furnace and send a master air loading pressure from the small hand loading unit in order to maintain a set forced air pressure under the grates of the Hofft furnace. This has one disadvantage, however: if the supply of bark becomes depleted, or for any reason is shut off, the measuring regulator will act to maintain the desired

constant pressure under the grate of the Hofft furnace, and since all of the fuel will have burned off of the grate, this regulator may open the damper wide in an attempt to maintain the desired pressure under the grate. This may rob the air from the oil burners, due to the fact that the forced air fan may not have sufficient capacity to maintain the desired pressure under the grates of the bark burning furnace when these grates are bare.

Accordingly we deem it advisable to make this regulator one of the positioning type so that it is possible for the operator to set a damper position, rather than to set the hand loading unit for a constant pressure under the Hofft furnace grate.

As the products of combustion are generated, the combustion chamber pressure regulator will operate the boiler outlet damper so that it opens or closes, as the case may be, to maintain the combustion chamber pressure constant at all rates of combustion.

Paper Machine Speed Control

There is another application for a measuring regulator of a very high-grade type in the control of paper machine speed.

In this system of speed control, the standard measuring-type of regulator with remotely located pressure sending elements is used. This small pressure sending element is located on the operating floor in a convenient position for the use of the papermaker. This sending unit dispatches an air loading pressure to a measuring-type of regulator in which the air pressure is balanced against a hydraulic-type of speed governor element. This element is of a rotary centrifugal type and is highly sensitive in a speed range of approximately 10 to 1. That is, the governor can go to one-tenth of its maximum speed and still maintain fairly accurate speed regulation. The pressure sending unit can be calibrated in revolutions per minute, or in feet of paper per minute, or in any way that may be desirable or convenient for the operator.

Thus, by setting the remote pressure control element to maintain any desired air loading pressure, the operator is, in effect, controlling the exact paper machine speed called for by that particular master loading pressure. In the regulator, the master loading pressure is balanced against the sensitive speed governor and this force balance is then applied to the power portion of the regulator. The regulator then can operate a steam valve for controlling a steam engine or rheostat for controlling a variable speed motor, or, on recent installations, can be used for controlling a hydraulic coupling or electric coupling, as the case may be. Thus, for a constant master loading pressure, the slightest tendency for the machine to change its speed is immediately counteracted by the regulator and the speed is maintained constant until the operator sees fit or necessary to change the speed by resetting the remote control element.

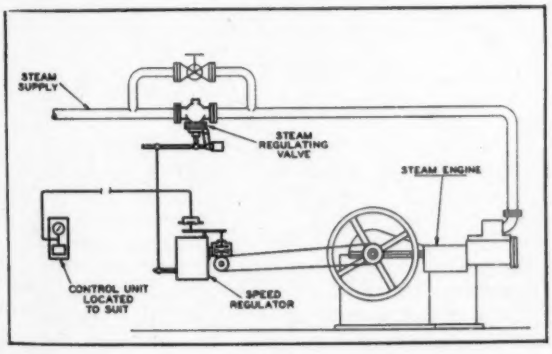

FIG. 9.
Speed Control

These paper machine speed regulators may be of the air-operated type or of the oil-operated type, depending on the power medium available at the plant under consideration.

Fig. 9 shows the elements involved in a speed control of this type.

At the present time we are studying the design of a tension regulator to accurately control the tension as actually measured in the paper. We have applied a system with some success in the woolen industry, where we have accurately controlled the tension of the warp where it is being reeled for the loom. We feel that with certain modifications, this system may well be adapted to the paper industry.

Thus, as more and more industries are becoming conscious of the value of accurate regulation, we are able to help fill the need for rugged and accurate regulating equipment.

We have prepared this paper in an effort to bring to the attention of the paper industry, in a simple presentation, the principles and fundamentals involved in the design and construction of this regulating equipment.

New Greene, Tweed Packing

As the first step in its expansion program, Greene, Tweed & Co., manufacturers of the universally known "Palmetto" and other brands of lubricated packings, 101 Park avenue, New York City, announce the addition to their line of "Palmetto" Compressed Asbestos Sheet Packing, which they state is the result of several years research. The new "Palmetto" sheet packing is made of long fiber asbestos, combined with superior bonding agents and is produced in uniform thicknesses. This packing has excellent storage qualities. The manufacturers say that it is an "all-purpose" flange and joint packing for superheated and saturated steam at high pressures and high temperatures and well-recommended for packing against air, ammonia, gases, oils, gasoline and most chemical solutions. "Palmetto" compressed asbestos sheet packing is readily identified by its characteristic light green color and the red trade mark "Palmetto" printed in a falling leaf design over the entire packing sheet.

Selecting Proper Materials

Allis-Chalmers Manufacturing Company's Feedwater Department, Milwaukee, Wisconsin, has issued a four page leaflet, R-6108, dealing with the effect of water conditions on the selection of pump materials. It points out the necessity of carefully investigating the type of water to be pumped and presents a number of factors in water that affect performance and service. This paper discusses the effect of these various factors on different pump materials with particular references to the influence of pH value. The information required to select intelligently the proper materials for pumps is outlined and a chart is included showing the proper materials recommended for various pH ranges.

The Importance of pH and Catalysts in Bleachery Operations*

By John D. Rue[1]

Abstract

The author discusses the value of hydrogen ion concentration control in relation to making bleach liquor, the composition of chlorine solutions, chlorine reactions, in hypochlorite bleaching, in the chlorination stage, in semibleaching sulphate pulp, and in washing pulps. A brief discussion of metallic catalysts is also given.

The term *p*H (hydrogen ion concentration) has taken on great significance in the pulp and paper industries. Its application will be recognized in water purification, sizing, dyeing, bleaching, washing pulp, and other phases of the processing. This paper will be limited, however, to the practical importance of *p*H in the bleachery operations.

Numbers in the *p*H scale represent the intensity of the alkalinity or acidity of a solution. Quantity does not measure intensity as evidenced by the fact it takes more of a weak acid than of a strong acid to give the same intensity, and intensity is often the more valuable measure of the effect on the operations which are taking place. A *p*H of 7 indicates neutrality. As the *p*H decreases from 7, the intensity of acidity increases; as it increases from 7 the intensity of the alkalinity increases.

pH in Making Bleach Liquor

In the bleachery, chlorine is one of the important chemicals used for purifying and bleaching chemical pulps. Its importance lies not only in its low cost, but also in the diversity of the reactions it can be made to undergo. Some of the vital variations in its reactioins can be controlled by varying the *p*H of the solution.

We are all familiar with the rapid rate at which bleach liquor decomposes when the solution becomes too acid, as it may; e.g., if too much chlorine is added to lime milk, a suspension of lime particles in a saturated solution of lime results. Lime is only slightly soluble in water, and the *p*H of such a lime milk is about 12.5. When chlorine is added it reacts with the dissolved lime to form hypochlorite. More lime dissolves but not quite rapidly enough to keep the solution saturated, and the *p*H decreases slightly. When all the lime is dissolved, the *p*H is between 11 and 12. A small further addition of chlorine causes a rapid drop in the *p*H. If the chlorination is stopped at any *p*H above about 11.2, the solution is reasonably stable unless the temperature is too high. If, by the further addition of chlorine, or by the addition of an acid, the *p*H continues to fall below 11.2, the solution becomes increasingly unstable, especially in contact with some metals or in the presence of impurities such as compounds of iron, manganese, nickel, or copper which may come in with the lime or water. Hence the importance, when making bleach liquors, that the solution is brought to the proper end point. Failure to reach the end point may leave a suspension of undissolved lime that will be lost in the sludge that separates when the liquor is settled; or may introduce an excess of alkali along with the liquor if the latter is used without being settled. If the end point is passed, stability can be reestablished by restoring the desired *p*H by the addition of lime. This must be done promptly if excessive loss of available chlorine is to be avoided. Any chlorine that may have become inactive will not again be made active by the restabilization of the solution.

The end point can be determined by means of the glass electrode *p*H meter, but the method is not well adapted to rough mill control. Color indicators are valueless in the presence of the bleach liquor. Fortunately the commonly used phenolphthalein flash test is satisfactory. When phenolphthalein is dropped on bleach liquor and the pink color disappears in three to four seconds,[2] the solution has the desired *p*H of approximately 11.2. That is a practical test procedure which any operator can successfully apply.

pH and the Composition of Chlorine Solutions

When the procedure is reversed starting with a solution of chlorine in water and gradually adding an alkali such as lime, most of the chlorine is merely in solution; but some reacts with water to form hypochlorous and hydrochloric acids. Hypochlorous acid is weak, in the small concentration found here and has a negligible effect on the *p*H. The hydrochloric acid gives the solution a relatively low *p*H (about 1.5 in a solution containing 5 grams per liter chlorine). The addition of lime neutralizes the hydrochloric acid and as a result more dissolved chlorine goes over to hypochlorous acid and the *p*H gradually increases.

The solution at *p*H 5 is essentially one of hypochlorous acid, as far as active chlorine is concerned. Dissolved chlorine has disappeared and the hydrochloric acid has formed inactive calcium chloride. Further addition of lime changes the hypochlorous acid to calcium hypochlorite and the *p*H again increases. At about *p*H 9.6, all the hypochlorous acid has formed calcium hypochlorite. Further additions of lime increases the *p*H by reason of the presence of increasing quantities of free lime. At about *p*H 12.5 further addition of lime will no longer dissolve and will remain in suspension. The solution is practically the same at this point as the one just before all the lime is dissolved when adding chlorine to lime to make bleach liquor.

The composition of the solution as regards active chlorine may be summed up this way: below *p*H 3 it contains chiefly dissolved chlorine; between 2 and 4 it contains a mixture of dissolved chlorine and

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[1] Member TAPPI, Hooker Electrochemical Co., Niagara Falls, N. Y.

[2] Bleach liquor at 30 grams per liter available chlorine and 80 to 90 deg. F. For other conditions the flash period must be empirically adjusted.

hypochlorous acid; at 5 it is chiefly hypochlorous acid; between 6 and 8 it is a mixture of hypochlorous acid and hypochlorite; and above 9 it is chiefly hypochlorite. Those relationships exist whether we add chlorine to lime milk or add lime to chlorine water.

pH and Chlorine Reactions

Dissolved chlorine—i.e., chlorine at low *p*H—tends to chlorinate so long as there is present organic matter that is capable of being chlorinated. Lignin is the chief substance in chemical pulps capable of being chlorinated. Cellulose and the hemicelluloses are more resistant to the effects of the chlorine. Chlorine or chlorine water, therefore, when added to a water suspension of pulp, chlorinate the lignin but have no appreciable effect on the cellulose. The reaction is rapid even at room temperature or below. The chlorinated lignins are soluble for the most part, either in water or in an alkaline solution. Here we have the basis for the first stage in a purification and bleaching procedure—i.e. the chlorination stage—which provides an excellent means of removing the lignin with a minimum of attack on the cellulose.

Hypochlorous acid and calcium hypochlorite are oxidizing agents. They dissolve lignin and discharge the color of impurities but do so by decomposing them through oxidation. Those chlorine compounds react also with cellulose but less rapidly than with lignin and the colored impurities. In the bleaching stages, it is important, therefore, to establish conditions which will permit the removal of the impurities before the cellulose has been attacked. Hypochlorous acid is a more rapid oxidizing agent than calcium hypochlorite; and it is difficult to find conditions under which its action on the impurities can be completed, before it has attacked the cellulose to a harmful degree. Furthermore, hypochlorous acid shows a marked tendency to react with itself to liberate oxygen which escapes as a gas, or to form chloric acid which reacts too slowly to be a bleaching agent. In either case some of the chlorine becomes ineffective for bleaching.

Calcium hypochlorite, however, oxidizes rapidly but not so rapidly as to prevent a reasonable degree of preferential attack on the impurities. For that reason, the hypochlorite bleaching stages are operated in a *p*H range in which the chlorine is in the form of hypochlorite.

pH in Hypochlorite Bleaching

Bleach liquor always contains some free alkali to prevent loss of active chlorine. When the liquor is added to any well-washed, unbleached or partially bleached pulp, the free alkali is sufficient to establish in the pulp mass, a *pH* of 8 or higher. As the bleaching proceeds, the *p*H decreases rapidly and then more slowly. The *p*H is below 7 during nearly half of the bleaching period.

The *p*H decreases as the result of the appearance of acids. Carbon dioxide (CO_2) is one of the chief offenders. It is formed when the hypochlorite oxidizes the organic matter just as in the more violent action of burning. One or more weak organic acids are also formed by bleaching reaction. Furthermore, hypochlorite itself becomes less alkaline as it loses its active oxygen.

The effects which these *p*H changes have on the bleaching reactions and on the strength properties of the bleached pulp may be undesirable. The bleach liquor, whether it be in the storage tank or mixed with pulp, becomes increasingly unstable as the *p*H decreases and tends to liberate oxyzen. If no pulp is present, the oxygen, just as it is formed, may attack both impurities and cellulose. It is in an active condition and the attack on the cellulose may become so drastic as to lower the fiber strength. Of course, the attack on the impurities is also drastic and bleaching proceeds rapidly but conditions are no longer favorable to a selective or preferential attack on the impurities. The net results are low brightness, except with the consumption of excessive quantities of bleach; low strength of bleached pulp; and lack of uniformity of quality of the product.

The unfavorable conditions in the bleaching stage can be corrected by preventing the excessive decline in *p*H by the addition of an alkali to the pulp. Experience shows that the *p*H should not fall below 7.5 or 8 at any time during the bleaching period. From the standpoint of strength of product, an even higher *p*H is desirable but may involve an extended bleaching period and difficulty in washing out the soluble impurties. The addition of alkaline in sufficient quantity, at the start of the bleaching, to prevent the *p*H from falling below 8 may cause so high an initial *p*H as to unduly retard the rate of bleaching. That difficulty is overcome in practice by adding only a portion of the alkali at the beginning and the remainder in one or more portions later in the bleaching period.

For the control of the *p*H during bleaching, some mills use sodium hydroxide and some lime; both give excellent results as far as the bleaching is concerned. Sodium hydroxide dissolves readily to a clear solution and is easy to store and apply but is relatively costly. Lime is lower in cost but presents some practical but not insurmountable difficulties. It is only slightly soluble and must be handled as a lime milk suspension which must be kept agitated to be uniform in concentration. The lime milk can be screened through a wire sieve of 150 to 170 meshes per inch to remove dirt and grit and so be made suitable even for high grade papers. Under some conditions, however, when mixing the pulp and lime, there is a tendency for a scale to be formed on the equipment. The scale may become a source of dirt in the pulp.

The quantity of alkali required to maintain the desired *p*H will depend on the thoroughness with which the pulp to be bleached has been washed, on the quantity of bleach required, and on the kind of alkali used. Upper normal conditions the quantity will bear a fairly definite ratio to the quantity of active chlorine used. That ratio will be of the order of magnitude of 0.2 to 0.3 pound of calcium oxide or its equivalent per pound of chlorine.

The use of too much alkali will greatly retard the rate of bleaching and may so extend the reaction period as to cause a loss of pulp strength as well as a reduction in equipment capacity. An increase in temperature will shorten the bleaching time but may do so at a sacrifice of brightness and strength.

pH in the Chlorination Stage

Normally no attempt is made to regulate or adjust *p*H during chlorination. Some hydrochloric acid is formed when chlorine is dissolved, and more of it when the solution reacts with the pulp. The acidity developed is sufficient to counteract any alkalinity that may exist in a well washed chemical wood pulp

and to establish a *p*H well within the range favorable to chlorination.

Occasionally the term chlorination is incorrectly applied to a procedure in which the chlorine is injected directly into the pulp suspension. Some high grade deinked paper stock is treated in that way. There is no appreciable quantity of lignin present, and the reaction is one of oxidation rather than chlorination. The alkali used in the deinking process is not completely removed by washing, and when chlorine is added forms a hypochlorite which bleaches in the normal manner. The quantity of chlorine required is small and insufficient to lower the *p*H into the range favorable to chlorination. In other words, the operation is merely one of making bleach liquor in the presence of the pulp. Larger proportions of bleach liquor can be made in the same way provided the necessary alkali is first added to the pulp.

In some cases it is desirable to allow the chlorination of chemical wood pulps (at *p*H of about 2 or less) to proceed for a short period and then, before exhaustion of the chlorine, quickly to change the *p*H by the addition of an alkali to something above 8; in other words to change the reaction from chlorination to oxidation. That is not an important procedure in the bleaching of sulphite but may be of vital significance with sulphate, especially when the product must possess the combined properties of high brightness and high strength. Some attempts to take advantage of this procedure have failed, because the change in *p*H was made too slowly or there was inadvertently exposed to the pulp, within a *p*H range of 4 to 7, some metal catalyst which is especially active in the presence of chlorine. If the alkali is added slowly or the rate of mixing of pulp with alkali is slow, at least a portion of the pulp is in contact with chlorine for a long period at a *p*H within the danger zone of 4 to 7 and a serious loss of strength may occur.

pH in Semibleaching Sulphate Pulp

In many cases it is desirable to bleach sulphate pulp to some extent but not to a high degree of brightness. For the lower shades the impurities need not be completely removed; and it is important from both an economy and a quality staindpoint, that the greatest possible brightening be obtained per pound of chlorine used. One factor which contributes to the attainment of this objective, is to maintain a *p*H that will ensure that no chlorine is lost by the formation of gaseous oxygen or of chlorates or is wasted in the unessential purifying operation of chlorination. The *p*H should not be permitted to fall below 8. As the demand for brightness increases, the quantity of bleach liquor required is increased, but there is a limit to the brightness that can be attained by this simple procedure and at the same time retain the full strength of the product. In other words, a point is reached where the high concentration of liquor fails to react selectively on the impurities, and where it begins to attack the cellulose. From that point it becomes increasingly important first to remove a part of the impurities at a low *p*H by chlorination so as to reduce the quantity of bleach required in the subsequent bleaching stage. That critical point in brightness varies with the kind and condition of the unbleached pulp.

Metallic Catalysts

Hypochlorites and hypochlorous acid suffer more or less decomposition under normal conditions, but the rate of decomposition is greatly increased in contact with certain metals. Typical of these are iron, copper, nickel, manganese, and some compounds containing them. Bleach liquor, in contact with a clean iron surface, will evolve oxygen fairly rapidly. Fortunately, an iron surface in contact with a lime bleach liquor soon becomes coated with rust and calcium salts, and the catalytic action of the iron ceases to be evident. Some iron tanks have been in successful use for years for making and storing bleach liquor. However, iron tanks are not good for settling the liquor. Some points on the metal become exposed and oxygen is given off. The rising bubbles keep the sludge from settling well.

Iron for pumps, valves, and piping, to handle bleach liquor are also satisfactory. Here again the iron becomes inactive by the formation of a hard protective coating. Such installations have been in use for years. Iron in contact with other metals, however, may result in some decomposition of the liquor and also in corrosion of one of the metals. All-iron or all-bronze pumps have shown good life and service but iron pumps with bronze runners have been known to require frequent replacements of the iron parts. In one installation, a copper alloy was used for the piping with the result that the liquor lost strength rapidly when circulated for continuous application to the pulp. Replacement of the alloy with rubber-lined pipe completely eliminated the difficulty and at the same time ensured a clean liquor.

In the bleaching of pulps, stainless steel and even Hastelloy C have exhibited marked catalytic effects when used for agitation. These effects are particularly harmful when the pulp is held for any appreciable periiod of time within a *p*H range of 4 to 7 as evidenced by a loss in efficiency in the consumption of chlorine and in a loss of pulp strength. The results have been observed in laboratory and also mill scale operations. The conditions may easily occur in the chlorination stage, when a change of *p*H from 2 or less to 8 is made before the chlorine is exhausted.

pH in Washing Pulps

In the bleaching and purification procedures, the impurities are brought into a soluble form by the various chemical reactions that take place; but they still have to be separated from the fibers, and that is not always an easy thing to do even with the excellent modern washing facilities that are available. A large portion of the impurities are in the water surrounding the fibers, and a displacement of that water with clean water is easily made and effectively removes them. Other portions, however, are held to the fiber surfaces by forces which resist the tendency of the soluble matter to pass into the water. Furthermore, soluble impurities are located throughout the fiber wall and can reach the surface only by diffusion, a process which requires time. It is evident, then, that even a thorough washing away of the impurities surrounding the fibers does not ensure a clean fiber. Such fibers, when suspended in clean water gradually lose their soluble impurities by diffusion into the surrounding water. After such a soaking period, the dirty water must again be washed off the fibres. Here we have the basis for the practice, which fortunately is becoming more widespread, of washing twice with a soaking period between. The practice is especially important when using the modern vacuum-type washers which effect the displacement of the impure water

rapidly and provide little or no time for diffusion through fiber walls.

Application of multiple-stage washing is limited for economic reasons to those cases where exceptionally thorough removal of impurities is essential, or where separation of the impurities from the fibers is unusually difficult. Among the impurities difficult to remove are those which are formed by the hot extraction of the pulp with sodium hydroxide. The more drastic that treatment, the more nonalpha material is dissolved and the greater the difficulty in washing the pulp. Some of the colored impurities removed from sulphate pulps by this procedure dissolve with difficulty, and the double wash with intermediate soak is important as a preliminary to the attainment of a high degree of brightness combined with high strength of pulp.

The demand recently has been for ever increasing degrees of brightness and for greater stability of brightness when the pulp or paper made from it is stored. The pulp, therefore, must be delivered from the bleachery with impurities removed to a degree not considered essential heretofore and in their removal *p*H plays an important part.

The concluding stage in the usual bleaching procedures is a hypochlorite bleach. Modern practice calls for the operation of that stage in such a way that the stock has a *p*H greater than 7 as it reaches the washer. Free alkali has a tendency to put the cellulose in a condition to increase the forces which attract and hold the soluble impurities to the fibers. If, however, the *p*H is reduced to less than 7, say to between 6 and 6.5, removal of those impurities takes place more easily, and so it has become accepted practice, especially when bleaching sulphate pulp to a high brightness, to double wash at the end of the bleachery procedure and to adjust the *p*H to the acid side during an intermediate soak of 20 minutes or more at relatively low stock density.

Some of the impurities themselves behave as color indicators and become brighter at a low *p*H but darken again when the original *p*H is restored. For that reason, the brightening effect produced by the addition of an acid may be completely lost when the acid is later washed out, especially if the wash water is slightly alkaline. But that brightening is not to be confused with the more permanent effect which follows the actual removal of the impurities, an effect which is improved with washing and which contributes to the stability of brightness when the product is stored.

The acid which, especially in the bleaching of sulphate, is preferred for *p*H adjustment, is sulphurous. It is formed when sulphur dioxide is injected into the pulp suspension. Its importance lies partly in the fact that it serves two other purposes; it acts as an antichlor and thus protects the fibers from the harmful effects of any unconsumed chlorine that may have escaped removal by the first wash; and, it tends to reduce ferric iron to ferrous which is more readily separated from the fibers. Ferric iron is usually present in kraft pulps in considerable proportions and if not removed or reduced may discolor the pulp or catalyze reactions during drying or subsequent storage that will impair the strength of the fibers.

Conclusions

In conclusion it is safe to say that only recently has the pulp industry come to a full realization of the importance in the manufacturing processes of relatively small changes of the intensity of alkalinity or of acidity. Modern *p*H equipment offers a means of determining and expressing those intensities and places in the hands of the operator a means of control which can go far towards making his product better, more uniform, and less costly.

Research in Industry*

By Everett S. Lee[1]

Abstract

The advance and value of research in industry is discussed briefly, and a short description of several developments resulting from research is given. Some of the developments discussed are the recording spectrophotometer, reflection meter, electric thickness gage, sound level meter and sound analyzer, and the traverse pressure recorder.

While the number of people in our country has been doubling in the past 50 years, your alert and progressive industry has increased the use of your products 6 fold, somewhere "paper" once meant the daily newspaper or the material the butcher wrapped the meat in, until today paper and its derivatives have been extended into many fields and are accepted without thought—like the air we breathe—adding immeasurably to our health, our comfort, and to our high standard of living. We, in the electrical industry, are proud to have had an opportunity to work in cooperation with the pulp and paper industries to electrically modernize the manufacturing plants, to increase the production, to make better grades, and more varieties of pulp and paper at greatly lowered costs.

To accomplish these results there must be the urge from within to seek that which is new, to find a better way, to discover the hidden wonders of nature in the processes which are in daily use and in the new process, all to the end that you make available new and improved products at lower costs. Research is the active response to this urge.

So much good has come from research and there is so much of merit to tell of its usefulness that one is staggered to compress into a few words an adequate picture. The recent report of over 1700 distinct research groups in this country, affording employment to some 50,000 workers, with an annual expenditure of from $150,000,000 to $200,000,000, with an existence dating back some 40 years, makes us realize that we are not dealing with a transient program but rather with an established fact.

The job of research is to find out new things. Test tube babies we call them. From the test tubes of industrial research have come many of the jobs that

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[1] Engineer, General Engineering Laboratory, General Electric Company, Schenectady, N. Y.

keep America busy. Fifteen million American men and women are at work today in jobs that did not exist in 1900. These jobs do exist today because, through research, industry has been able to develop hundreds of new products. It has been able to make them so inexpensive that millions of people have been able to buy them.

Measurements

One phase of research which is little discussed though its presence is everywhere and its function is fundamental for measurements.

Lord Kelvin has stated "that when you can measure what you are speaking about and express it in numbers you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science whatever the matter may be."

Lord Kelvin made that statement in May of 1883 in an address before the British Institute of Civil Engineers, London, England; and as I have had opportunity to bring to many people the thought he has expressed, they have universally agreed to its perfectness. Our ability to measure, therefore, becomes a measure of our advance in knowledge, of the effectiveness of our research, and of the extent of our application of the new knewledge uncovered by research.

Voltage Magnitude of Lightning

I well remember when the voltage of our electric power transmission lines were being extended upward, until they had reached 220,000 volts. In some sections the ravages of lightning were most severe on transmission-line operation causing outages with resulting discontent. It became imperative to learn the characteristics of lightning, its voltage, its time duration, and its current magnitude. To measure these was an almost insurmountable problem, as no one knew when or where the lightning was going to come; and when it came, it only remained for a few millionths of a second which would not allow much time for human beings to gather around to make the measurement. However, spurred on by the genius of Dr. Steinmetz, engineers found the means of voltage measurement in the figures produced on a photographic film by the lightning voltage using the researches of Dr. Lichtenberg in Germany in 1777 and of two Frenchmen, Trouvelet and Brown, in 1888. Figures such as these, at once beautiful in their appearance, and yet being a long way from a measuring device in concept, provided the necessary tool, and engineers were soon talking of the voltages caused by lightning, several million volts, with the ease and nonchalance of a 110-volt application.

Duration of Lightning

But in addition to the voltage magnitude they needed to know the time duration—and here cathode-ray oscillographs were moved into the field, to obtain the signature of the lightning. The first photograph of a high voltage surge on a transmission line due to lightning to have been obtained in this country, shows the voltage to have attained its maximum in seven millionths of a second and to have disappeared thirty millionths of a second later. It cost $10,000 to obtain that picture, and I have had many tell me they wouldn't give me a nickel for it. So they wouldn't, for they would not appreciate its worth to the engineers who had to know in order that their equipment would withstand the ravages of lightning. And thus it is with so much of research that has been the life blood of making things available for people to use. The result seems so obvious after it is made available, but little thought is given to what made it available; nor that it might never have been available if the research had not been performed nor if those directing the business had not been sympathetic to it. Sympathy for research on the part of those who direct is the fundamental source of new achievement.

Electric Thickness Gage

In a steel mill the thickness of a sheet of steel moving at a speed of 1500 feet per minute is determined by an electric gage which also can be made to control it. The electric gage together with electric drive features in the modern steel producing equipment of today has allowed for an increase of speed through the mill from 300 feet per minute to 1500 feet per minute, a measuring technique that came from the research to provide proper and adequate fits and surfaces in the finished parts in the modern electric refrigerator, gages that show upon the scale one-inch deflection for each one ten-thousandths of an inch in the dimension of the piece.

Another result of research is an electric gage for measuring the thickness of aluminum foil as it goes through the mill, without any contact to tear the foil. As it goes through the electric flux in the jaws, minute electric currents are generated, and these are a function of the thickness of the foil. Here again one ten-thousandths of an inch in the thickness of the foil shows up as one inch of pointer travel on the instrument scale.

Comparable gages for paper have been provided although these have not yet been largely applied. These are of the contact type which have proved their usefulness in many other applications. There have been many calls for gages of the noncontact type, particularly for coated materials. The capacitor principle is the only one we know for this application, but our experience with open capacitor plates in the presence of humidity effects is that the capacitance will vary beyond tolerated limits. We have searched in vain for other suitable means. Could there be more extensive application of the contact type of gage, its superior characteristics could be realized, and as is often the case, continued work in this field would give promise of bringing into existence the new ideals that are needed for the noncontact applications. It would appear, therefore, that application of the contact type gage would be advantageous.

Straightening Filling Threads

For straightening the filling threads of cloth, electrical equipment is used. Two beams of light move underneath from the center of the cloth, outward to the edges, and as they speed beneath the threads two photo-tubes mounted above count the blinks caused by the threads. If the two counts are equal, the threads are square; if the two counts are unequal, the threads are not square, and the control circuits instantly and continuously operate to make them square. At average speeds of average cloth these little counter tubes are seeing as many as 6,000 blinks per second, and even up to 10,000 blinks per second send their messages to the control equipment.

Television

Such signal performances recalls to us the research which brought us vacuum (electron) tubes and which

has opened up extended fields in industry, in radio, and now in television. When I can sit in my home in Schenectady, and see a baseball game in New York City, see the races at Belmont Park, or a track meet in Madison Square Garden, with all the attendant enthusiasm of actually being present, and realize that each of the little individual light elements from the field are being transformed to electric currents dancing under complete control at frequencies of millions of cycles each second and are again transformed to light elements on the tube of my receiver, showing me an exact reproduction of what is going on 160 miles away, it just makes you feel that nothing is impossible if we only continue to bring into play the ability to take that which we find and apply it—and may it be applied usefully.

Electric Motor and Insulated Wire

The heart of practically all electricity is the motor. One of the latest results of research to this fundamental product is Formex wire, of greater durability than heretofore. Now there is not much romance in putting a coating of enamel on wire and for over thirty years enameled wire remained much the same. Recently chemical research brought forth a new material and electrical research, recognizing its potency as a wire insulation, developed new means for its application—an advance anew in this field which had lain dormant of new ideals for so long. And to prove it, a new measurement had to be devised—a heat-shock test in which the old product blistered—the new product remained durable and firm. In addition to this the instruments developed to test Formex wire present an imposing procession; these are: the abrasion tester for measuring the durability of the film; the compression tester for determining the solidity of the film; the continuity tester for assuring that the film is perfect throughout without any holes or flaws; the reflection meter for determining that the film has been properly baked; and the scrape tester for measuring the "stick-to-itiveness" of the film to the wire. This is quite an imposing array of instruments to evaluate an insulation film, but when such an evaluation is necessary for certainty of performance, these instruments result. Even though this is regarded as the first advance in enamelled wire insulation in many years, and it is due entirely to research, the urge to immediately search anew for even a better product has manifested itself to the end that the activity in this regard has been quite complete. Over 2,000 samples have been newly examined in the past two years, full evidence of the faith in research to produce.

Sound Level Meter and Analyzer

The sound level meter and sound analyzer, instruments for evaluating sound and expressing it in numbers, and the development of this instrument itself required research by the engineers from the communication field so that the values of sound would be in accord with the sensation of the human ear. Such measurements are not simple to make. The sound measurement of a common buzzer is relatively complex when compared with the sound measurement of a good whistle giving a pure tone, a one-thousand-cycle note. The vibration of a motor causes sound and research studies to improve the motor, so that an amplifier was required to measure the reduced vibration. Motors are tested in the assembly line for quietness. Thus two advances in motor performance came from research—Formex Insulation and quiet motors.

Recording Spectrophotometer

The recording spectrophotometer (a color machine to Mr. Average Man) is most fundamental in principle, giving a curve for any color as a function of the reflection of each minute wavelength of light throughout the visible spectrum. Dyes, inks, paints, and lacquers, always made to the same curve will look alike. So sensitive is this instrument that its

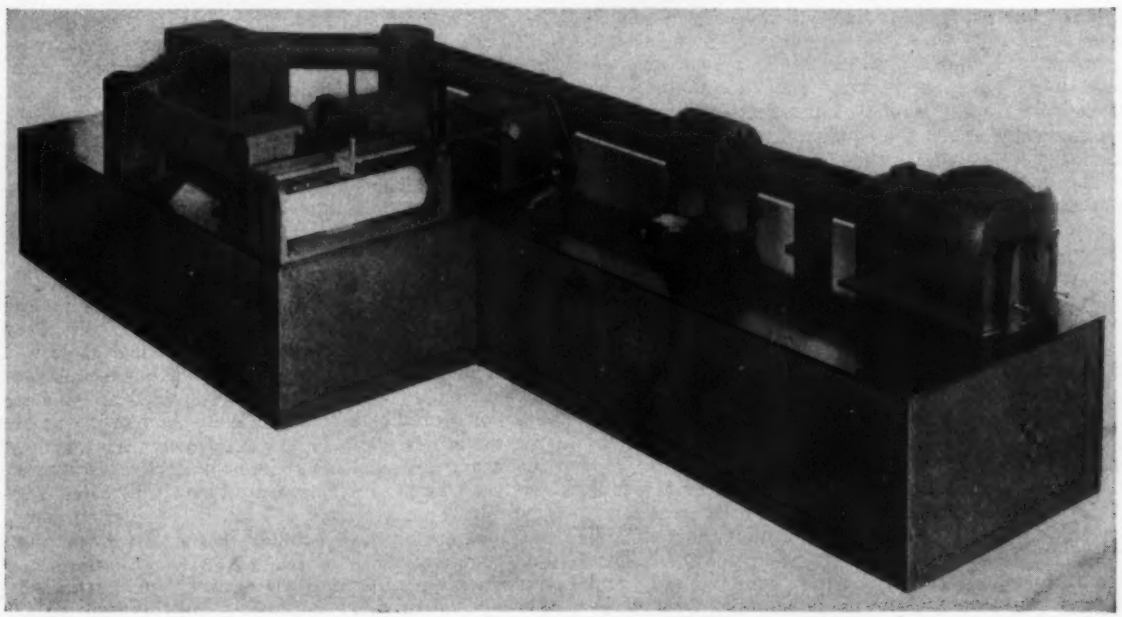


FIG. 1.
Recording Photoelectric Spectrophotometer

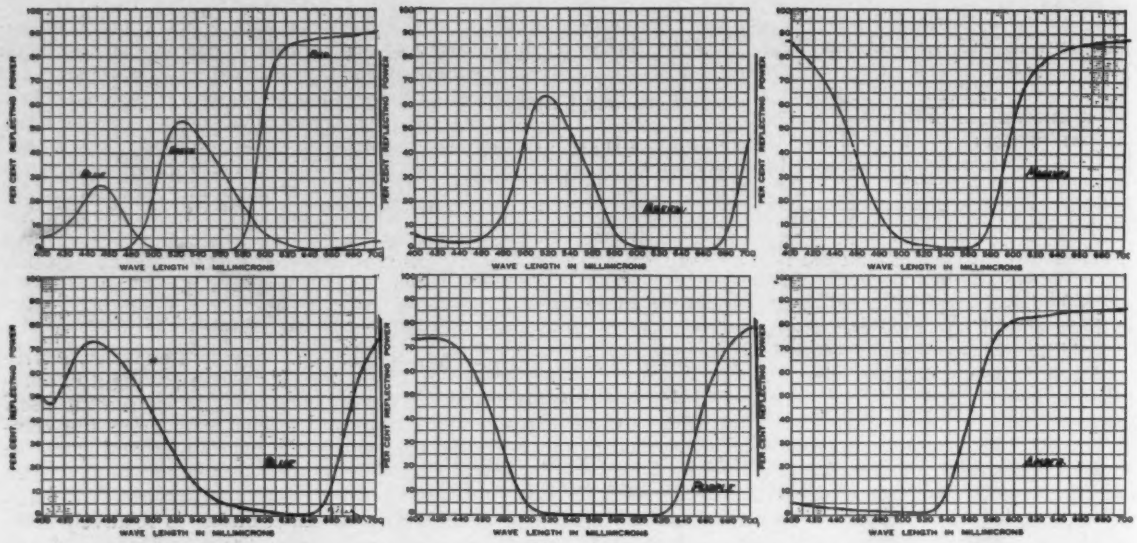


FIG. 2.
Curves Made by the Recording Spectrophotometer

smallest measurable unit is the amount of light which would fall on my hand from a candle a mile away. It is a product of research. It allows finishes to be applied to parts of equipment made in different places to be brought together as one part and to look exactly alike. It allows a record of a color to be made and sent by facsimile from one place to another. The recording spectrophotometer is used in the pulp and paper industries, and extensive use is made also of one of its derivatives, the reflection meter. This instrument provides for better uniformity of color of pulp and paper. (See Figs. 1 and 2.)

The steam research covering flow phenomena in turbine nozzles, buckets, exhaust hoods, and other parts of the steam turbine has resulted in such knowledge that these can be safely predicted. These phenomena require many measurements and long calculations. The traverse pressure recorder was developed to simplify these. The nozzle is placed in position, the air is blown through, and the resulting pressure, mass flow, and energy are automatically recorded on this machine. Photoelectric integrators automatically solved the equations to give the results instantly.

The dew point potentiometer for determining the moisture content of gases is used in some of our annealing processes. It provides a compact and conveniently portable instrument for use, wherever the moisture content of gases must be known for testing or control purposes. Generally, the successful measurement of moisture is one in which there has been much research to provide simpler and better means though the results have not been altogether satisfying. The problem of the control of moisture in paper is one of long standing, and although much thought has been given to it nothing really successful has emanated.

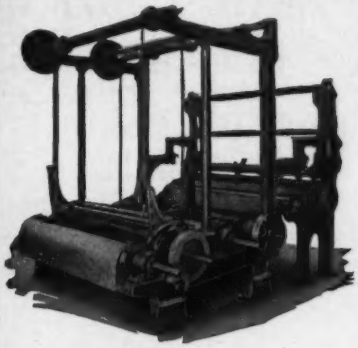
Infrared radiation has been suggested as a means of drying. Where infrared has been used to advance the baking, the amount of evaporation is small and the liquid to be evaporated is quite volatile. These two factors do not apply in the drying of pulp and paper, therefore, the power consumption would be high. Using present values, the relative cost of steam as compared with electricity for paper drying is about 1 to 5. The simple configuration of paper is also greatly in favor of the use of steam. Some new thought of heat generation or utilization will have to be found to satisfy this problem.

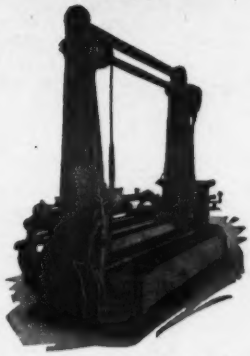
The story of the use of paper as an electric insulation in high-voltage electric power cables is interesting. It was not many years ago that the highest voltage of these cables was 66,000 volts. The insulation consisted of paper wrapped tightly around the conductor, treated with a compound, and the whole covered with lead. Though it was the best known method at that time, no one was satisfied with the result. So research was again called to help.

Measurements became prominent in first obtaining a bench mark of quality. Small samples of the cable operated at room temperature at 44,000 volts lived for about 90 hours. It suggested that life tests should be made at higher temperatures, say 85 deg. C., but shorter life was expected as was usual with most insulating materials. However, with these samples, at the higher temperature much longer life was obtained, some over a thousand hours. Cooling the sample to room temperature caused it to break down electrically thus ending its life. This was a most unusual result. The reason was soon found.

The treating compound, though of fairly high consistency at room temperature liquified at 40 deg. C., thus producing at the higher temperatures an oil-filled paper insulation which is the best electric insulation of its kind. This was learned from capacitor insulation, using the best capacitor paper, a product of most extensive research and thus oil-filled cable was born. So perfect was this insulation that it was predicted that the voltage could be doubled and the insulation would be better than ever. And so it was for the cable, designed for 132,000 volts, that was first made and installed never had an electric failure, so perfect was the insulation of the paper treated with the oil. There are over 400 miles of paper insulated oil-filled cable in this country in successful operation today, operation so perfect that electric failures are unknown. Just as we in the electrical industries have been proud of this outstanding contribution, so you in the pulp and paper industries may be proud of the part of your product in it.

"M & W" HIGHSPEED DRUM WINDERS AND SLITTERS





FOR ALL PURPOSES

Either FOUR DRUM or TWO DRUM type. Paper wound with uniform hardness regardless of grade or weight.

Perfect Shipping Rolls.

Special attachment eliminates welts.

Ideal for end of Paper Machine.

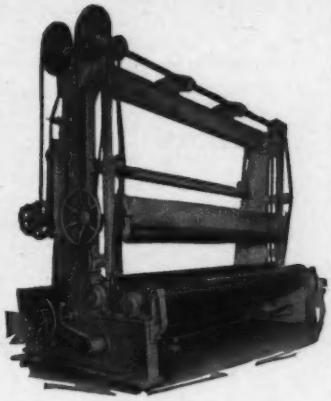
Also for rewinding or use in connection with Super Calender.

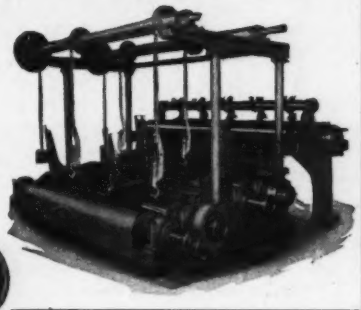
Shear Cut Slitters give perfect edges without dust.

Positive separation of rolls.

No interweaving.

Patented
"QUICK THROW-OUT"
Intermediate Top Slitter Units
Save Time.





The MOORE & WHITE Co.
PHILADELPHIA, PA.
N. PHILA. STA. PENNA. R.R.
PAPER MILL MACHINERY

To Remove Stone Flanges

For want of a better name this is styled a Dismantling Device. It is a compact, self-contained unit to facilitate the troublesome operation of removing pulpstone flanges, and is available in two designs for any size of stone.

Particulars will be gladly furnished on request.

Montague Machine Company

Turners Falls, Mass.

Imports of Paper and Paper Making Stock

Effective September 30, 1939, under Treasury Decision 49,970, all publications, exchanges and trade associations, were denied access to import manifests at the New York Customs House. The Paper Trade Journal and other interested parties have vigorously protested this ruling, and as soon as the order of the Treasury Department is modified or rescinded, full publication of all manifests will be resumed in these columns. In the interim, the Paper Trade Journal is making every possible effort to gather all available information from manifests, at various outside sources.

NEW YORK IMPORTS

WEEK ENDING JUNE 22, 1940

SUMMARY

Cigarette paper.....161 cs.
Newsprint .....6,396 rolls
Cardboard .....202 cs.
Writing paper .....8 cs.

CIGARETTE PAPER

E. F. Pipe Co., ——, Genoa, 121 cs.
Heemsoth Kerner Corp., *Express,* Genoa, 40 cs.

NEWSPRINT

H. G. Craig Co., Inc., ——, Donnacona, 336 rolls.
International Paper Co., ——, Gatineau, 420 rolls.
H G. Craig Co., Inc., ——, Donnacona, 337 rolls.
——, ——, Liverpool, N. S., 4,313 rolls.
H. G. Craig Co., Inc., ——, Donnacona, 352 rolls.
International Paper Co., ——, Gatineau, 288 rolls.
H. G. Craig Co., Inc., ——, Donnacona, 350 rolls.

CARDBOARD

Atlantic Stereotype Co., *Express,* Genoa, 104 cs.
Rapid Electrotype Co., *Express,* Genoa, 98 cs.

WRITING PAPER

The Morilla Co., *Exhibitor,* Marseilles, 8 cs.

RAGS, BAGGINGS, ETC.

Chemical Bank Trust Co., ——, Bombay, 243 bls. cotton waste.
Padawer Co., ——, Bombay, 50 bls. cotton waste.
E. J. Keller Co., Inc., *Exchester,* ——, 146 bls. old bagging.
W. Steck & Co., *Exchester,* Alexandria, 365 bls. old bagging.
Irving Trust Co., *Exchester,* Alexandria, 195 bls. old bagging.
Castle & Overton, Inc., *Exchester,* Alexandria, 86 bls. old white cotton rags.

PHILADELPHIA IMPORTS

WEEK ENDING JUNE 22, 1940

Castle & Overton, Inc., *Exchester,* Alexandria, 69 bls. old cotton rags.
Harris Goldman Co., *Exchester,* Alexandria, 154 bls. old cotton rags.
E. J. Keller Co., Inc., *Exchester,* Alexandria, 52 bls. old white cotton rags, 68 bls. old cotton rags.

LOS ANGELES IMPORTS

WEEK ENDING JUNE 22, 1940

——, *Cascade,* Ocean Falls, 1912 rolls newsprint.

THOSE WHO ATTENDED THE CONVENTION

(Continued from page 72)

John D. Rue, Hooker Electro Chemical Co.
E. M. Rupp, National Engineering Co.
Arthur Randall, Oxford Miami Paper Co.
George Riedel, Tomohaw Kraft Paper Co.
C. P. Robinson, Heppenstall Co.
F. H. Rosencrands, Combustion Engr. Co.

S

F. A. Samuelson, John W. Bolton & Sons, Inc.
Miss Emma A. Schade.
Mr. and Mrs. J. Scheuermann, Cameron Machine Co.
A. K. Schifflin, Link Belt Co.
Mr. and Mrs. J. Carl Schmidt, Dupont Co.
Paul R. Schreiber, General Dyestuff Corp.
Mr. and Mrs. Norman B. Scott, Orr Felt & Blanket Co.
V. L. Shaw, Perfecting Service Corp.
W. L. Shaw, Heller & Merz.
H. W. Sherman, Northern Paper Mills.
R. M. Shields, Duriron Co.
Chas. M. Shipway, Wm. E. Cooper & Sons Co.
A. C. Shively, Harris-Seybold-Potter Co.
H. Sinnigen, E. P. Lawson Co., Seybold Machine Co.
C. P. Slocum, Corn Products Sales Co.
A. F. Smith, General Electric Co.
C. B. Smith, Huron Milling Co.
Frederick E. Smith, Hollingsworth & Vose Co.
Robert G. Smith, Northern Paper Mills.
R. H. Smith, Reliance Elec. and Engineering Co.
Mr. and Mrs. Royal H. G. Smith, Sorg Paper Co.
Stephen W. Smith, New Haven Pulp and Board Co.
W. E. Sooy, Gardner Richardson Co.
George H. Spencer, Pusey & Jones Corp.
Mr. and Mrs. Oscar Stamets, Riegel Paper Corp.
Howard Stansell, West Carrollton Parchment Co.
A. H. Stanton, Mason Neilan Regulator Co.
Mr. and Mrs. S. G. Stapley, Provincial Paper Co.
L. Starck, H. & T. McCluskey & Sons.
Chas. E. Stevens, The Morrow Mfg. Co.
R. C. Stewart, Shartle Brothers Machine Co.
F. A. Stickle, Stickle Steam Specialties Co.
Mr. and Mrs. R. R. Stoltz, Westinghouse Electric and Mfg. Co.
Jerry P. Strasser, Stein Hall & Co., Inc.
Mr. and Mrs. G. H. Suhs, Sorg Paper Co.
D. H. Sutherland, Sutherland Refining Corp.
Mr. and Mrs. Glenn Sutton, Sutherland Paper Co.
Frank F. Schrier, The Moore & White Co.
C. E. Stoke, Tomahawk Kraft Paper Co.

T

Benj. E. Teale, Crane & Co., Inc.
G. R. Tennent, Hummel-Ross Fibre Corp.
K. E. Terry, S. D. Warren Co.
Mr. and Mrs. John L. Thome, Crane Company.
Mr. and Mrs. L. A. Thompson, Hercules Powder Co.
Geo. A. Thompson, Jr., Perkins & Sons.
Fletcher Thornton, Stowe-Woodward, Inc.
C. H. Tildes, J. E. Rhoads & Son.
Mr. and Mrs. Frank J. Timmerman, Northern Paper Mills.
R. Tobin, Pond Extract Co.
E. A. Turner, International Nickel Co.
Mrs. J Turner, Escanaba, Mich.
I. A. Turner, Dupont Co.
B. M. Thomas American Coating Mills.

U

R. H. Underdown, New York Color and Chemical Co.

V

Mr. and Mrs. Ray Van Cleef, Hammersley Mfg. Co.
H. L. Vanderberg, A. E. Staley Mfg. Co.
R. W. VanKirk, Penick & Ford, Ltd.
Tinkham Veale, Reliance Electric and Engineering Co.
Jas. R. Verdon, American Cyanamid and Chemical Co.
Carl Vicario, Nash Engineering Co.
H. K. Vinton, Paper Trade Journal.

W

H. W. Waffenschmidt, National Aniline and Chemical Co., Inc.
A. L. Walker, Texas Gulf Sulphur Co.
Mr. and Mrs. G. C. Walton, Downingtown Mfg. Co.
Kurt Wandel, Marcalus Mfg. Co.
Mr. and Mrs. A. P. Wandtke, Heller & Merz Co.
Mr. and Mrs. N. P. Wardwell, Carthage Machine Co.
Mr. and Mrs. Jos. A. Waters, American Wringer Co.
A. E. Waugh, United States Rubber Co.
H. F. R. Weber, Link Belt Co.
R. R. Weber, The Mathieson Alkali Works, Inc.
Mr. and Mrs. J. V. Wedgwood, Manhattan Leather Co.
Mr. and Mrs. Howard E. Wehr, Mead Corp., Heald Division.
N. O. Weil, W. S. Tyler Co.
Mr. and Mrs. Arnold Weller, Sutherland Paper Co.
S. C. Wentz, P. H. Glatfelter Co.
Mrs. Robt. G. West, Cincinnati, Ohio.
Harry E. Weston, Fritz Publications, Inc.
Washburn Weston, American Wringer Co.
Cash Whipple, Beloit Iron Works.
E. V. White, Cincinnati, Ohio.
W. H. White, Atlantic Refining Co.
Frank H. Williams, Crane & Co., Inc.
Bill Williamson, Shuler & Benninghofen.
Walter F. Wolfe, Mac Sim Bar Paper Co.
Jack Fife Wright, National Aniline and Chemical Co.
Mr. and Mrs. Jesse G. Wright, A. M. Meincke & Son, Inc.
C. G. Watson, Youngstown Welding & Engineering Co.
W. J. Weed, Electro Bleaching Gas Co.
F. E. Winslow, General Electric Co.

Y

Mr. and Mrs. J. W. Youngchild, International Paper Co.
Mr. and Mrs. Byron Yule, F. S. Huyck & Sons.
C. E. Youngchild, International Paper Co.

Z

Mr. and Mrs. F. L. Zellers, French Paper Co.
Miss Thelma Zellers, Niles, Mich.
Henry C. Zeni, American Cyanamid and Chemical Corp.

1. Increase your SPEED

2. Reduce your STEAM

3. Improve HARD EDGES

The NEW Brandon
"ZEPHYR"

Lightweight - Open Back - Dryer Felt

Fastest Drying with least steam not to mention lowest first cost.

From high speed News, Board and Kraft down to Bond and Tissue, this new felt is proving a revelation to mill superintendents.

Try it at our risk!

MOREY
Paper Mill Supply Co.

150 Causeway Street, Boston, Massachusetts

(Sole Agents Brandon Dryer Felts)

* Patents Pending and Trade Mark Reg. U. S. Pat. Off.

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Paper Dyes

TECHNICAL
SERVICE

COMPETENT TECHNICIANS
IMMEDIATELY AVAILABLE
FOR YOUR COLORS PROBLEMS
MAY WE SERVE YOU?

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40 RECTOR STREET, NEW YORK, N. Y.

BOSTON	SAN FRANCISCO	NEW ORLEANS
PROVIDENCE	CHARLOTTE	CHATTANOOGA
CHICAGO	GREENSBORO	PORTLAND, ORE.
PHILADELPHIA	ATLANTA	TORONTO

BRANCHES AND DISTRIBUTORS THROUGHOUT THE WORLD

NATIONAL N DYES

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending June 26, 1940

	High	Low	Last
Armstrong Cork Co.	31¼	29½	30
Celotex Corp.	6⅛	5⅞	5⅞
Certain-Teed Products Corp.	4½	4	4
Certain-Teed Products Corp., pf.	20½	18½	19
Champion Paper & Fibre Co.	22	21½	21½
Champion Paper & Fibre Co., pf.	99½	99½	99½
Congoleum-Nairn Co.	15¼	14½	14½
Container Corp. of America	12½	11¼	11½
Continental-Diamond Fibre Co.	6⅜	6	6
Crown-Zellerbach Co.	14⅜	13½	13¾
Crown-Zellerbach Co., pf.	83	81½	81½
Flintkote Co.	13¼	12¼	12¼
Robert Gair	3	2¾	2¾
Robert Gair, pf.	12	12	12
International Paper & Power	13⅜	11⅝	12¼
International Paper & Power, pf.	49¼	45¾	46
Johns-Manville Corp.	54½	53	53⅛
MacAndrews & Forbes	27	26¾	27
Masonite Corp.	23½	22¾	22¾
Mead Corp.	9⅜	9⅛	9⅛
Mead Corp., pf.	71	71	71
Paraffine Companies, Inc.	28¾	28	28⅜
Rayonier, Inc.	16¼	15½	15½
Rayonier, Inc., pf.	28¼	27½	27½
Ruberoid Co.	13½	13⅜	13½
Scott Paper Co.	38	37½	37⅞
Scott Paper Co., pf.	109	107½	109
Sutherland Paper Co.	22	22	22
Union Bag & Paper Corp.	11⅜	10¼	10⅝
United Paperboard Co.	3⅜	3¼	3¼
U. S. Gypsum Co.	55	51	51¾
U. S. Gypsum Co., pf.	173	173	173

New York Curb Exchange

High, Low and Last for Week Ending June 26, 1940

	High	Low	Last
American Box Board Co.	4⅝	4⅝	4⅝
Brown Co., pf.	15	15	15
Great Northern Paper	42	42	42
National Container Corp.	10½	9½	9½
St. Regis Paper Co.	2¾	2½	2½
St. Regis Paper Co., pf.	57½	57	57½
Taggart Corp.	3	2¾	2⅞

Chickasaw Mills Near Completion

M. L. Madden, president of Hollingsworth & Whitney Company, announced to the directors of the company at their meeting this week in Boston that the company's new Chickasaw Mills at Mobile, Ala., are nearing completion and are expected to be in production in a few weeks' time, and that the operating executives at Mobile have been chosen.

The Chickasaw Mills have been built under the supervision of Samuel D. DeForest, assistant to the president of Hollingsworth & Whitney Company, who has been in charge of the project at Mobile since its inception. The abrupt changes in world conditions have just recently called him to South America in connection with the markets there for the company's products.

F. W. Nason, who collaborated with Mr. DeForest in the company's research leading up to the planning of the Chickasaw Mills and who has been assistant to Mr. DeForest during the construction, will remain at Mobile until the completion of the mills. Mr. Nason has been promoted to the position of technical director. His headquarters will be in the North.

The operation of all of the mills of the company is under the direction of Robert Nivison, manager of mills, who has just made one of his frequent inspection trips to the Chickasaw Mills.

D. E. Cousins has been appointed resident mill manager of the new Chickasaw Mills. Mr. Cousins has had extensive experience in pulp and paper making in the South and is admirably fitted to carry forward skillfully the Company's manufacturing policies.

William Nivison has been appointed assistant to Mr. Cousins. He has long served the company as superintendent of one of the Northern mills. V. C. Watters will be in charge of the paper mill, while R. F. Cuyle will be in charge of the pulp mill. C. V. Riefenberg is to be office manager, and H. G. Torbert will have the position of executive secretary to Mr. Cousins. G. A. Redden, chief engineer of the company, will remain in charge of the engineering staff at Mobile. F. B. Smith has been made power engineer at the Mobile plant. R. F. Weston as chief forester will have charge of wood procurement. Other appointments to the operating and engineering staff are pending and will be announced later.

Chickasaw Mills include a pulp mill, bleach plant, and paper mill. There will be both Fourdrinier and cylinder paper machines. Unbleached and bleached sulphate papers will be manufactured.

Government Paper Bids

WASHINGTON, D. C., June 26, 1940—Government Printing Office has received the following bids for 55,000 pounds of M. F. book paper in 38 inch rolls; R. P. Andrews Paper Company, 5.38 cents; Whitaker Paper Company, 5.31 cents; Fitchburg Paper Company, 5.65 cents; Stanford Paper Company, 5.21 cents; Barton, Duer & Koch Paper Company, 5.38 cents; Marquette Paper Company, 5.4 cents; Paper Corp. of U. S., 5.95 cents; Old Dominion Paper Company, 5.973 cents.

For 13,000 pounds (100,000 sheets) 50 per cent rag, 20 x 25 blue antique cover paper; Mudge Paper Company, 9.85 cents; R. P. Andrews Paper Company, 11.97 cents; Whitaker Paper Company, 10.06 cents; Barton, Duer & Koch Paper Company, 8.76 cents; Stanford Paper Company, 9.88 cents; Walker, Goulard Plehn Company, 9.9 cents less 1 per cent; Paper Corp. of U. S., 9.79 cents.

For 60,000 sheets of 24 x 36 white cloth lined paper; Barton, Duer & Koch Paper Company, $82.24 per M sheets; Middlesex Products Company, $81.00; Cauthorne Paper Company, $82.69; Nashua Gummed & Coated Paper Company, $91.00 less 2 per cent; Mathers-Lamm Paper Company, $82.24; Whitaker Paper Company, $82.18; Mudge Paper Company, $82.21; and R. P. Andrews Paper Company, $85.53.

For 2,110 sheets of 20 x 25 green gummed paper; Whitaker Paper Company, $12.15 per M sheets; Virginia Paper Company, $12.00; R. P. Andrews Paper Company, $10.50; and Mudge Paper Company, $9.70.

For 4,995 pounds (10,000 sheets) various size No. 1 dry finish rope manila paper; R. P. Andrews Paper Company, 16.2 cents; Walker, Goulard Plehn Company, 25 cents less 2 per cent; and Graham Paper Company, 16.5 cents.

For 26,550 pounds, various sizes, 100 per cent rag, white ledger paper; Barton, Duer & Koch Paper Company, 18.43 cents; R. P. Andrews Paper Company, 19.63 cents; Stanford Paper Company, 19.75 cents; Walker, Goulard Plehn Company, 23.5 cents; Mudge Paper Company, 22.71 cents; and Paper Corporation of U. S., 18.57 cents.

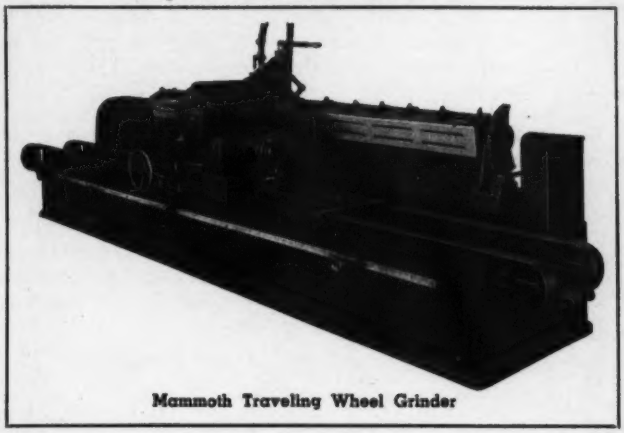
KNIFE GRINDING SERVICE

The Oldest The Most Widely Employed The Newest

The Covel-Hanchett slitter knife grinder, for universal and precision slitter grinding service, built for accurate finish and long time operation, now thoroughly proven and widely employed.

Timken Roller Bearing and Precision Ball Bearing construction helps identify it as Covel-Hanchett service.

For Slitter Knives



Mammoth Traveling Wheel Grinder

Covel-Hanchett Mammoth Traveling Wheel Grinder, for long knives, short knives in multiples, heavy knives, light knives, doctor blades; for real economy from the heaviest requirements in stock removal to the extreme in accuracy and light cuts, with preloaded precision bearings and automatic lubrication; has now established such wide recognition as to represent the standard in the industry—the highest standard ever reached in paper knife and doctor blade grinding service.

Our new catalogue covering *all* saw and knife fitting requirements should be always available for your reference. Sent free upon request.

COVEL-HANCHETT CO., Big Rapids, Mich., U. S. A.

"NON-USERS ARE THE LOSERS"

TENAX FELTS

FINISH AND SPEED

"men and minds meet"

Many Superintendents will carry problems to the Convention for discussion with friends — one of which will be *operation of felts.*

By specifying TENAX FELTS you have complete assurance of uniformity, constant helpfulness in producing perfect paper, ability to get rid of water at the presses, and long-lasting usefulness.

If not already using TENAX FELTS, a review of their favorable record will prove it advisable to start now, in this, THE FIFTIETH YEAR OF PROGRESS OF TENAX FELTS.

"Non-Users Are The Losers"

LOCKPORT FELT COMPANY

NEWFANE, N. Y.—U. S. A.

New York Paper and Pulp Market Review

Paper Mills Showing Increased Anxiety Regarding Future Supply of Pulp —No Shipments of Pulp From Scandinavian Countries—Paper Stock Market Firm With No. 1 Mixed Paper, Corrugated and Flat Book Stock Up.

Office of the PAPER TRADE JOURNAL,
Wednesday, June 26, 1940.

The wholesale paper market is reported strong with the trend in demand and prices upward under the stimulus of rising general business activity. Reports from many manufacturers, representatives, jobbers, and general paper merchants during the week indicate that sales volume in most lines of paper and paper products is at a high level and underlying factors are very favorable for a substantial increase in production and consumption in the second half of this year.

The index of general business activity rose to 102.4 per cent for the week ended June 15, compared with 90.6 per cent for the corresponding week last year.

Paper production of 229 mills for the week ended June 15 was estimated at 94.3 per cent, compared with 75.0 per cent for 1939, with 65.6 per cent for 1938, with 89.0 per cent for 1937, and with 78.3 per cent for the corresponding week in 1936.

Paper board production for the week ended June 15 was 79.0 per cent, compared with 67.0 per cent for 1939, with 53.0 per cent for 1938, with 71.0 per cent for 1937, and with 71.0 per cent for the corresponding week in 1936.

Trade reports indicate demand for many grades of paper and paper board continues at an encouragingly high level. Although the trend in prices is upward no uniform price level has as yet been established. For some months a few lines of paper have been out of line and proportionately lower than others and this situation has been more or less adjusted at this date. Only a few mills have advanced prices at this date to paper merchants. Higher prices will, however, occur during the third quarter and these increases range from $3 to $10 per ton on contract orders, uncoated book paper falling within the $3 per ton advance, while offset and lithographic papers will, in some new price lists, be advanced up to $10 per ton. Sulphite papers, writings, groundwood, tissues, and kraft wrapping papers are in active demand and production and shipments continue at a high level.

Mechanical Pulp

No important change has been reported in the market situation in mechanical pulp this week. Prices are firm and unchanged.

Chemical Pulp

No important change has occured in chemical pulp during the current week. Some paper mills are showing increasing anxiety regarding the future supply of pulp and requests from paper manufacturers to pulp producers and dealers are stressing the need for prompt shipments. No change in the current quotations on any standard grade of pulp has been reported this week. No shipments of pulp have been reported from Scandinavian countries and no immediate change and resumption of shipments from the northern countries is expected in the trade in the near future.

Rags

Trading in the domestic rag market is reported as moderately active, with mills showing interest in a few grades. No important change in prices has been reported this week, excepting on No. 2 roofing rags, which are up a few cents and currently quoted at from .85 to .90.

Old Rope and Bagging

The old rope market is reported rather quiet at this date. Prices hold firm and no important changes from prevailing market quotations have been reported this week. Demand for old bagging is moderately active. No important changes in prices have been reported this week.

Old Waste Paper

Prices hold firm in all grades of paper stock, with only three important price changes reported to date. Solid flat book stock has advanced to 1.25 to 1.30; corrugated to .72 to .77½; and No. 1 mixed paper is up and currently quoted at from .47½ to .52½.

Twine

The twine market is firm. No important change in the market situation has been reported this week. Prices are unchanged.

Import Committee Files Complaint

A dumping complaint has been filed by the Import Committee of the American Paper Industry against the dumping of hanging paper raw stock imported from Canada and delivered to a New York state wall paper printer at $4 below the f.o.b. mill price in Canada.

Imports of six shipments of newsprint paper from Canada are before the United States Customs Court, docketed for trial in Duluth in June. All are of paper over the maximum weight of 35 pounds permitted for newsprint paper, two of the shipments weighing 35.48 pounds, two 35,72 and two 35.95. They are claimed by the importer to be duty free as standard newsprint.

Imports of groundwood papers from Canada in April show the effect on prices of the depreciation of Canadian currency, and also the manner in which Canadian mills are absorbing the market for such paper formerly held by Scandinavia. Imports totaled 1,200 tons as against 800 tons for the same month of 1939, but the total value of the 1940 shipments was only $58,000 as against a value of $56,000 for two thirds of the quantity in 1939. The depreciated Canadian currency is largely responsible for the reduced value.

Colored groundwood paper imported in sheets through Minnesota ports was held dutiable as printing paper, and not allowed free entry as standard newsprint though in light tints.

PAPER TRADE JOURNAL

JUNE 27, 1940

Established 1886

JUL 1 1940

Preparedness

"To be prepared for war is one of the most effectual means of preserving peace."

WASHINGTON.

The wisdom of Washington's words has never been more evident than today.

Preparedness is also an essential of business. It is necessary to anticipate any contingency to insure the smooth functioning of the wheels of industry.

Our experience based on 54 years' association with the Paper & Pulp Industry has prepared us to best serve your interests.

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22 EAST 40th STREET NEW YORK, N. Y.

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REPORT OF SUPERINTENDENTS' CONVENTION

DOWNINGTOWN

An ADDITION +++++ *of Principles*

MULTIPLIES XXXXX *the Results*

Duo-Dehydration with One Unit

WIRE FACED SUCTION ROLL

A Suction Roll with a Wire Face, which provides much more water removal area per square inch of suction box area than the drilled holes in a conventional suction roll. Removes several times more water than a Suction Drum Roll or an Extractor Roll, which has a wire face but no suction area. Installed after last vat or following the Downingtown Patented Extractor Unit. If you would like a report on the results being obtained by users of the Downingtown Patented Wire Faced Suction Roll, write us. . . . The Downingtown Mfg. Co., Downingtown, Pa.

NEW TO THE INDUSTRY—OLD TO US

They Started Something!

WHEN Drake struck oil in 1859, his achievement marked a tremendous stride in the development of the petroleum industry—a development that has contributed immeasurably to the success of a host of other industries. Drake's well near Titusville was less than seventy feet deep—produced only a few barrels a day; yet it opened up untold possibilities. Today the industry in America is driving its wells miles into the earth, producing more than a billion barrels a year. And petroleum chemists convert the crude oil into hundreds of indispensable products: the high-quality gasolines that have spurred the growth of automotive transportation; lubricants to keep industry's machines operating at peak efficiency; fuel oil to furnish comfortable heat and to power Diesel engines; paraffin, waxes, asphalts.

The first cylinder of Liquid Chlorine made by EBG in 1909.

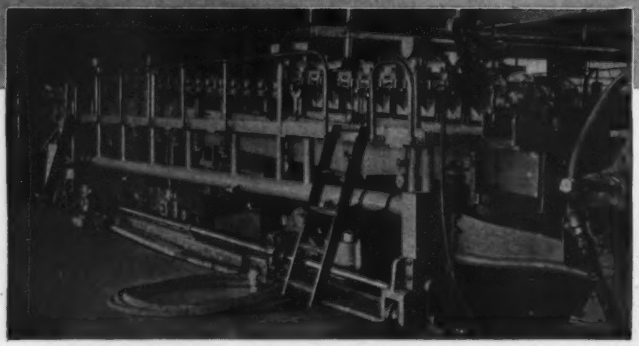
EBG engineers, too, opened up new vistas when they first successfully produced Liquid Chlorine in America. The country's population benefited, for Liquid Chlorine provided a powerful weapon in the war against water-borne diseases. By its effectiveness in the purification of water supplies and in the sterilization of sewage, EBG Liquid Chlorine has made possible new standards of public health. And the paper and textile industries benefited by the more efficient, economical bleaching methods made possible by EBG Liquid Chlorine.

EBG engineers are pioneers in the production and servicing of Liquid Chlorine. Profit by their long experience—specify EBG Liquid Chlorine.

ELECTRO BLEACHING GAS COMPANY
Main Office: 60 East 42nd Street, New York, N. Y.
Plant: Niagara Falls, N. Y.

EBG Liquid Chlorine
FIRST IN THE COUNTRY

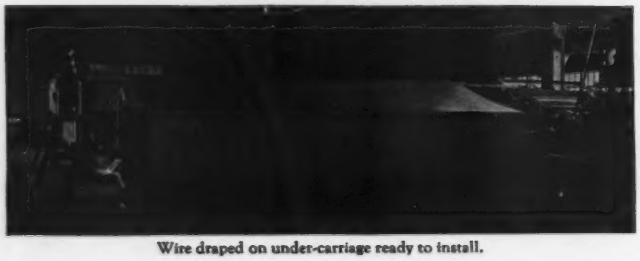
. . . wire is draped in tending aisle, then mechanically installed in operating position.



Fourdrinier in operating position.

Wire holder handled by crane.

Under-carriage in position ready to drape wire.



Wire draped on under-carriage ready to install.

Views show installation of Fourdrinier Wires by exclusive Puseyjones "Rapidrape" Method, at Southland Paper Mills, Lufkin (Herty) Texas.

"Rapidrape" Wire Handling is just what its name suggests—a new easy way to drape Fourdrinier Wires. Production formerly lost through shut-downs is reduced to a minimum because the handling time is shortened.

With "Rapidrape" Wire Handling, the under-carriage is rolled into the tending aisle on suitable tracks set at floor level, then rolled back to operating position after the wire is on. Cleaning is simplified with the under-carriage in the aisle.

There is no danger of deflection stresses and distortion as experienced with complete removal or cantilever change. The Fourdrinier part remains in perfect alignment at all times, adequately supported at front and back. Can be installed without disconnecting shake mechanism, suction box hoses, showers or frame supports.

Be sure that your next machine is equipped with "Rapidrape" Wire Handling, as well as other patented improvements that make Puseyjones the leader in the design and construction of paper-making machinery.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

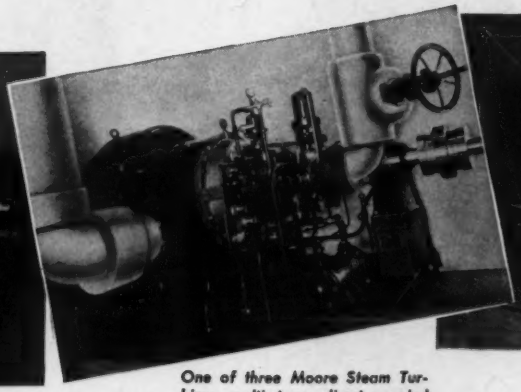
THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-making Machinery

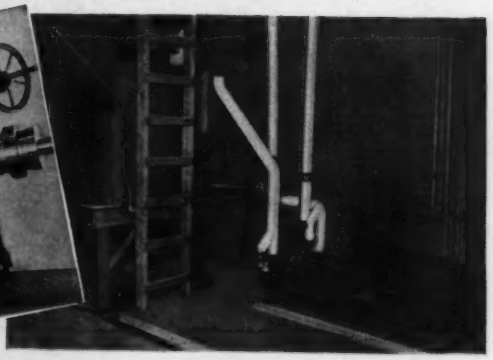
Wilmington, Delaware, U. S. A.

Paper Industry . . .

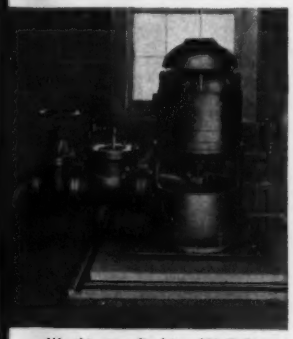
Three Moore Steam Turbines, driving boiler feed pumps



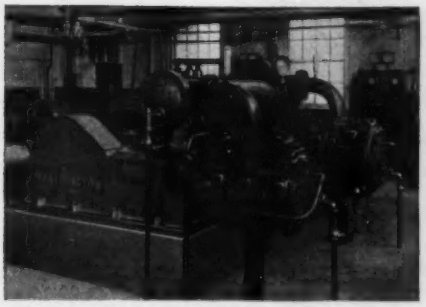
One of three Moore Steam Turbines, multi-stage, direct coupled into lineshaft, driving paper machines in a large mill in Canada



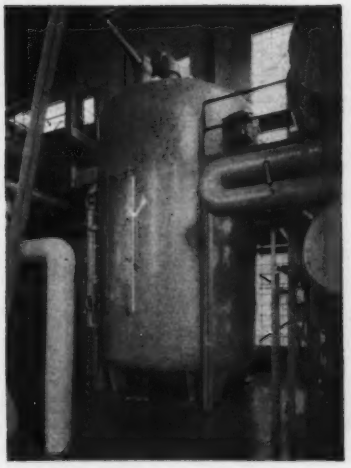
Worthington Type CH Centrifugal Pumps, pumping black liquor and salt cake to a recovery unit, in a large Southern mill



Worthington Turbine Well Pump, for main mill water supply



Worthington Air Compressor, 2-stage, direct connected to motor, for general air supply

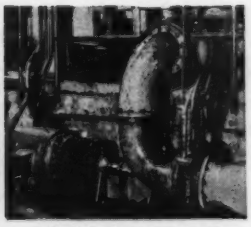


Worthington Deaerating Feedwater Heater, in power plant service

Worthington Type CT Worthite Centrifugal Pumps, on acid service

Worthington Type CG Worthite Centrifugal Pump, for handling alum

Worthington Rotary Gear Pumps, for viscous liquids



Worthington Type KE Elbow Propeller Pump, on white water service

WORTHINGTON PUMP AND MACHINERY CORPORATION

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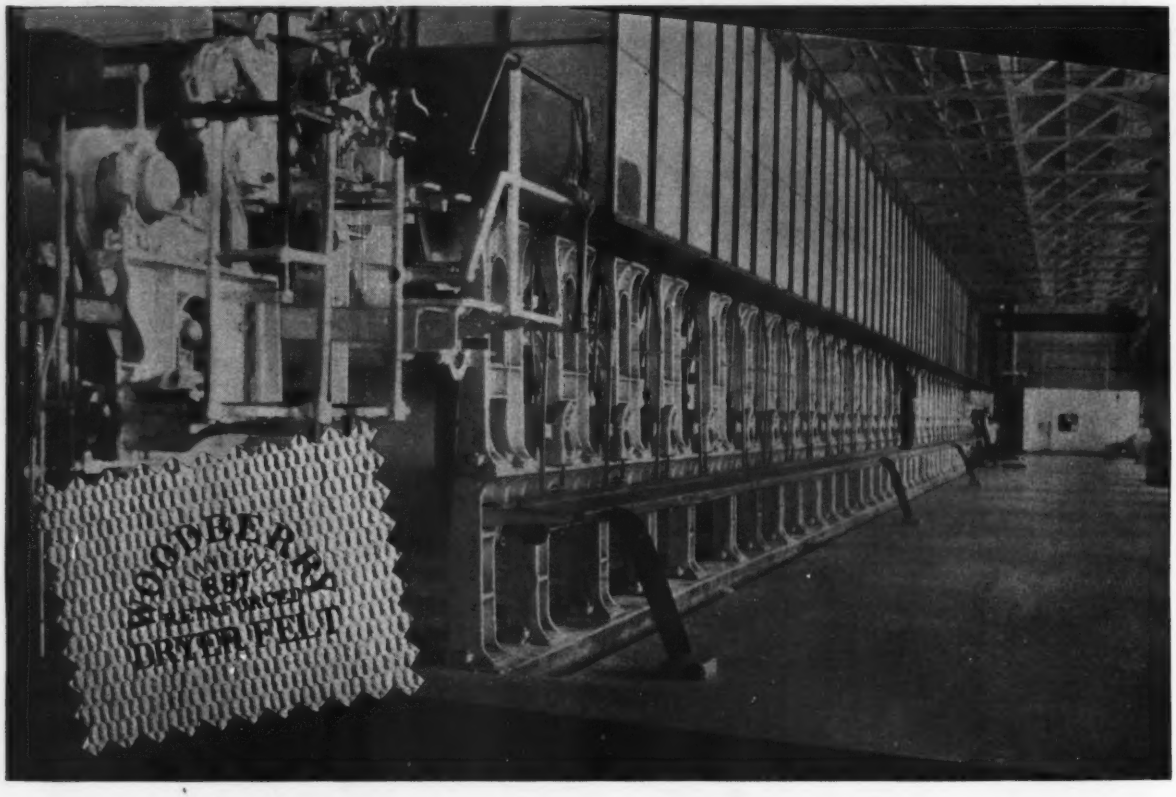
WORTHINGTON

A Champion in Paper Making Economies

WOODBERRY 887 Reinforced Dryer Felts



Record after record for low cost production falls before this new champion WOODBERRY 887 reinforced dryer felts. Asbestos yarns woven at intervals into the face of these long life felts greatly reduce dryer felt costs per ton of paper. They account for fewer shut downs, fewer adjustments and a comparatively low steam consumption. In WOODBERRY 887s, shrinkage and stretch have been reduced to a minimum. They continue in service making fine qualities of paper long after other cotton felts cease to perform at all. Specify WOODBERRY 887s for longer life and more economical operation.

MT. VERNON WOODBERRY MILLS, INC.

TURNER HALSEY COMPANY

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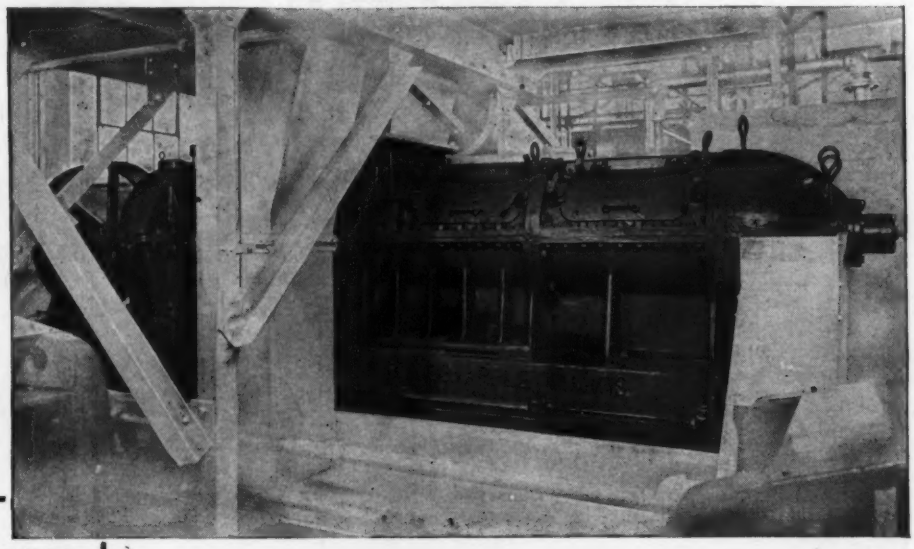
ECONOMICAL PULP THICKENING

with the

VALLEY SCREW PRESS



APPLICATIONS

High Density Bleaching

●

Thickening for Beaters

●

Pulp Washing System

●

Thickening for Shipment

●

Closed White Water System

●

4 to 40% CONSISTENCY

HIGH CONSISTENCY operations save steam, water and chemicals.

HIGH CONSISTENCY operations use smaller tanks, pumps and less floor space.

HIGH CONSISTENCY operations are the present trend.

THE VALLEY SCREW PRESS has proved itself the logical machine for High Consistency.

Let us help you develop an economical high consistency process in your mill. Write us for complete details.

VALLEY

IRON WORKS COMPANY

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Flat and Rotary Screens • Thickeners • Deckers • Paper Markers • Roll-Headers

A PROVED WAY TO HELP KEEP

Electric Motors Trouble-Free!

To maintain efficient electric motor operation use:

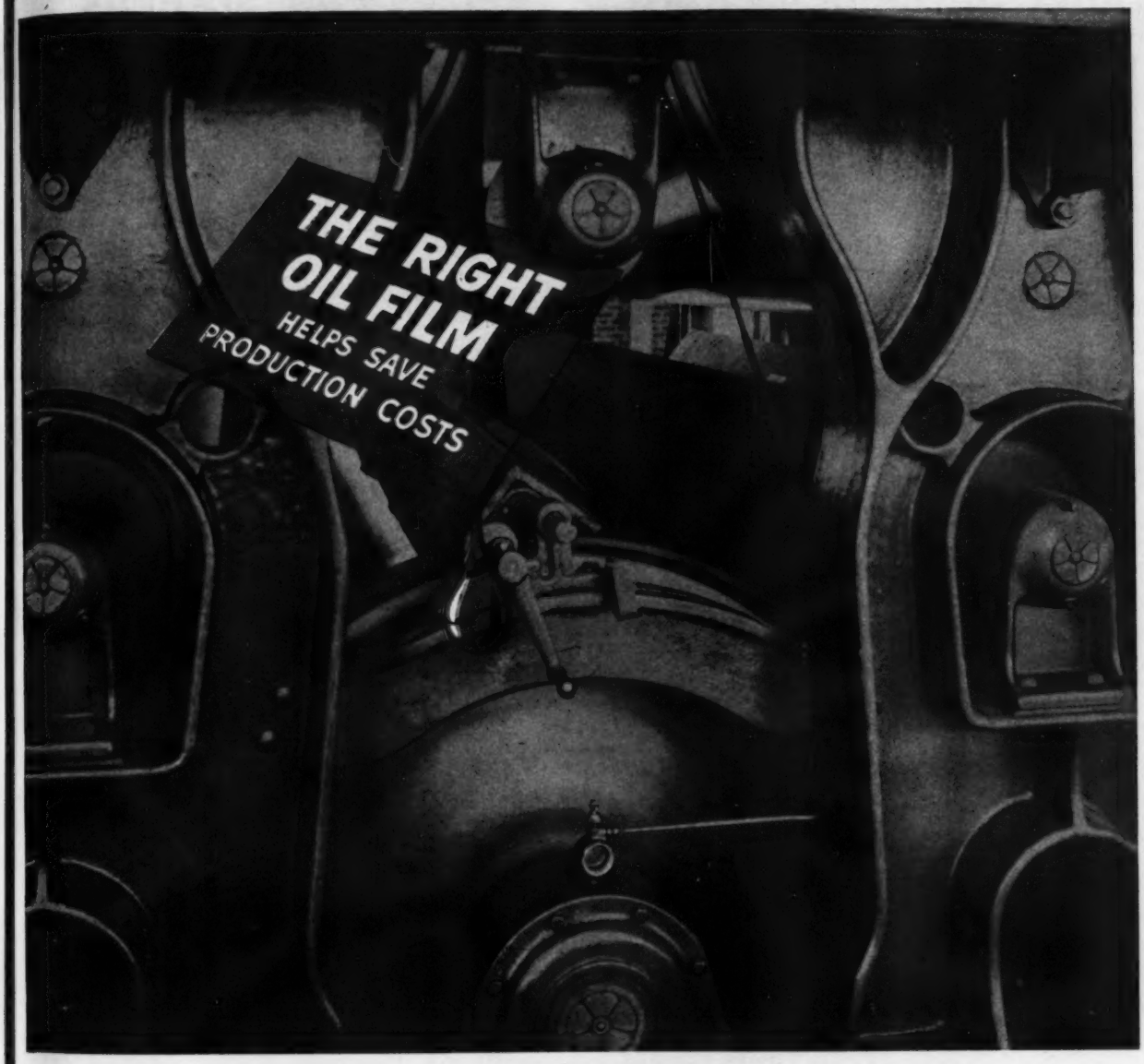
1. Gargoyle Etna Oil Heavy Medium. It resists gumming and formation of deposits in plain bearings . . . helps prevent oil-soaked windings.
2. Gargoyle BRB Greases. They protect fine antifriction bearings from wear, rust and corrosion.

CALL IN **Socony-Vacuum for**

You'll Profit from these "Exclusives"

☞ **SKILLED LUBRICATION COUNSEL** of a Socony-Vacuum man backed by 74 years' experience . . . the greatest in the Petroleum Industry.

☞ **A COMPLETE LINE** of Lubricants . . . the scientifically correct lubricant for every type of machine you now own . . . or will buy.



Correct Lubrication—

☞ **NEW LUBRICANTS** ahead of new needs . . . developed in close cooperation with machine builders by famous Socony-Vacuum laboratories.

☞ **HALF A MILLION CASE HISTORIES** to guide our engineers in recommending the right use of these lubricants to earn Lubrication Profits for you.

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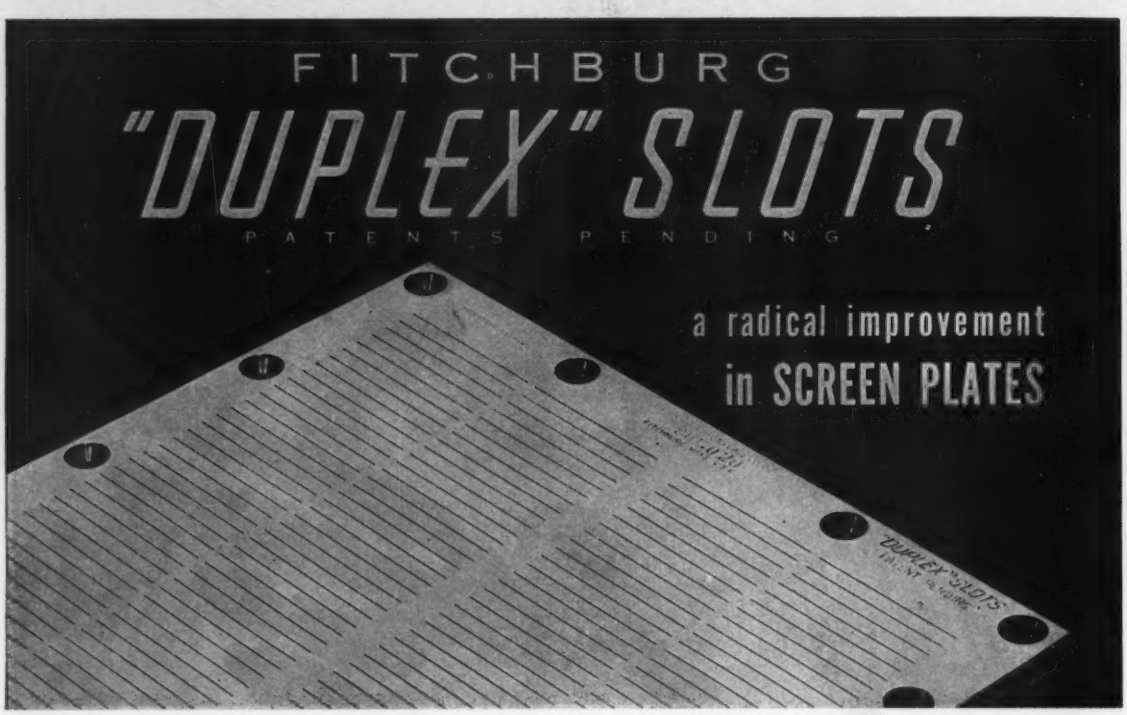
GARGOYLE
Lubricants

Paper Screens • Board Screens • Felt Screens



Flat Screen Efficiency—*here it is!*

The Fitchburg

NEW TYPE--"DUPLEX" SLOT PLATE

Now available with 4-5 or 6 slots per inch

Highest capacity your screens ever produced. Cleanest stock due to permanent true slot alignment—no bent or spread bars. This patented plate cannot plug up, or hold slime and strings in slot corners. Longer life because its construction withstands damage. A "step-up" in your production line from the moment they are installed. Let us recommend the correct plate for your job.

***Guaranteed* to improve your screening**

FITCHBURG SCREEN PLATE CO., Inc.

301 South Street, Fitchburg, Massachusetts

Stretching and inspecting Fourdrinier wires are two of many operations at Lindsay that call for extreme care and thorough training.

A PROGRESSIVELY FINER PRODUCT—

WE are thankful that our stake is in an industry whose primary demands are for a finer and yet finer product year after year. This applies both to your task of making paper and to ours of making wire cloth. Both are exacting processes. You and we cannot be too careful, too alert, too thorough. It is impossible to be too well equipped. In drawing, annealing and weaving Fourdrinier wires; in measuring, finishing and inspecting them; even in winding on cores and in boxing, an almost unbelievable degree of care is a merely elementary consideration. Such standards of quality have been steadily maintained and steadily raised at Lindsay since the beginning thirty-seven years ago.

THE LINDSAY WIRE WEAVING COMPANY

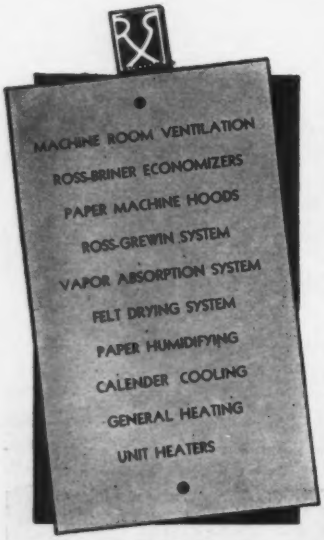
MAKERS OF PAPER INDUSTRY WIRE CLOTH

14001-14299 ASPINWALL AVENUE — CLEVELAND, OHIO

Lindsay WIRES

FOR PAPER MILLS

ROSS-GREWIN SYSTEM improves quantity and quality of output—and with lower power costs!



There are many good reasons for the more than 200 installations of this efficient high pressure ventilation system. Easily and quickly installed, the Ross-Grewin System begins at once to increase drying capacity and improve quality of output by achieving more even drying across the sheet. Felts last longer. Cost of power and steam is extremely low. There is no interference with machine operation. Write for illustrated bulletin describing the system in detail. No obligation.

J. O. ROSS ENGINEERING CORPORATION

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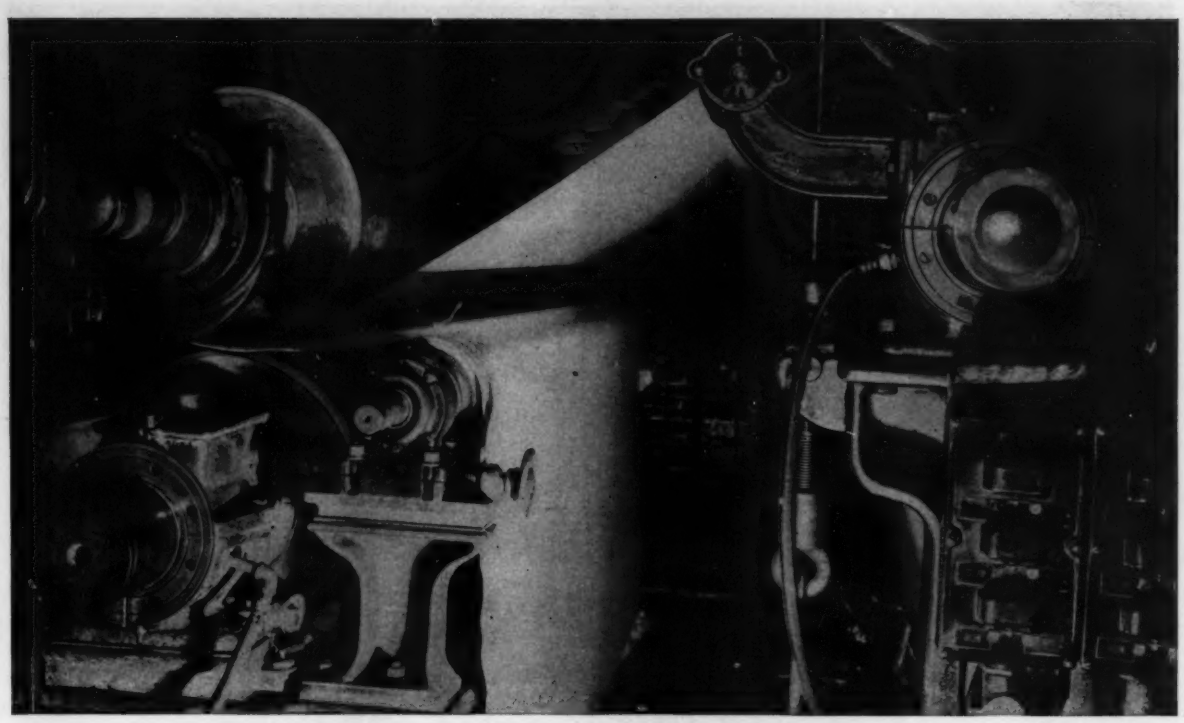
ROSS ENGINEERING OF CANADA, LTD., Dominion Square Building, Montreal

ROSS SYSTEMS



MANHATTAN Rubber Covered Rolls

Step up Production, Quality and Service

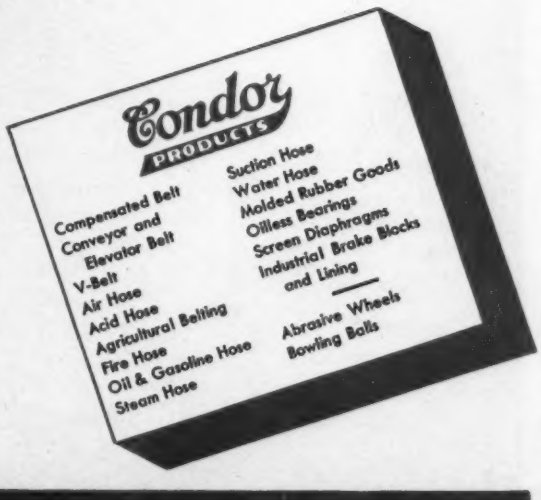
EVERY MANHATTAN Rubber Covered Roll for the paper industry has added to it, in the making, the valuable ingredient of experience in controlled compounding and curing of the covering, in precision grinding under the guidance and with the skill of men who have spent years in this highly technical work.

This accounts for the virtually perfect nip, the uniform squeeze, the added life to felts, the undisturbed formation and finish, the freedom from cracking and deckle wear and the uniform quality of paper and board produced with MANHATTAN Rubber Covered Rolls.

You save through longer service from equipment, better and more economical production.

Have your next rolls made or recovered by MANHATTAN, and then keep service records.

Plants at Passaic, N. J.; Neenah, Wis. and North Charleston, S. C.



THE MANHATTAN RUBBER MFG. DIVISION
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The supremacy of
PERKINS
CALENDER ROLLS
is the natural result
of the broadest
experience in the
paper industry.

B. F. PERKINS & SON, INC.
ENGINEERS AND MANUFACTURERS
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The
MULLEN
Recognized
the World over
as the Standard
Bursting
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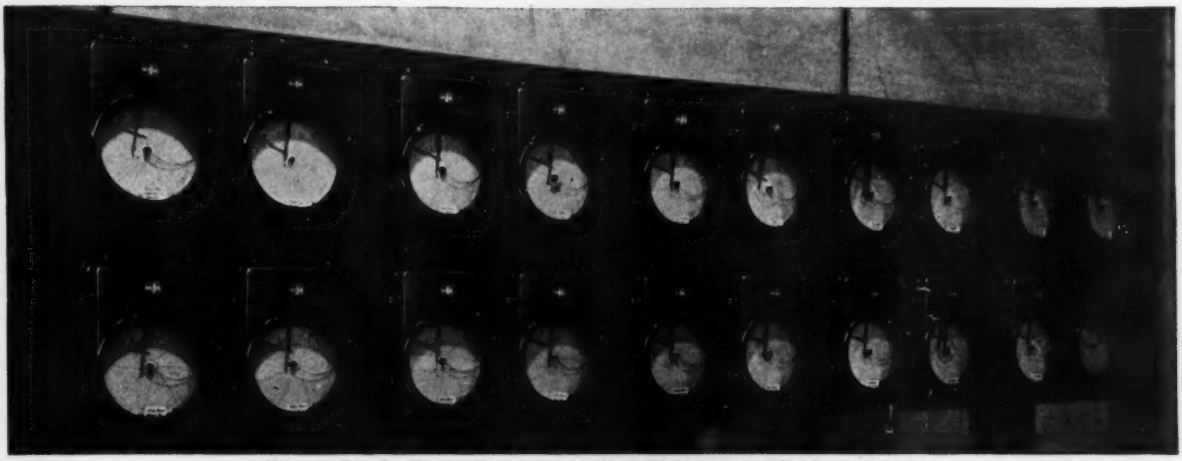
Rayonier Incorporated

SERVED BY

19 Bristol's Electric Flow Meters!



Nineteen Bristol's Electric Flow Meters serving Rayonier Incorporated at Fernandina, Fla.

And that isn't all! In this modern plant of the Fernandina Division of Rayonier Incorporated at Fernandina, Fla., there are in addition to the 19 Bristol's Electric Flow Meters shown the following equipment:

Two Bristol's Thermometers for recording boiler steam temperatures.

Bristol's Two-Pen Thermometer for "water in" and "acid out" temperatures.

Bristol's Two-Pen Gauge for recording acid fan pressure.

Bristol's Recording Gauge for acid fan vacuum.

Another Bristol's Recording Gauge for charting pressure in acid plant tower.

The nineteen Bristol's Electric Flow Meters, conveniently mounted on a panel in the turbine room where they are constantly in view of the engineer, tell at a glance the flow of (a) steam supplied to 5000 k.w. turbine, (b) bypass steam, (c) turbine exhaust, (d) feed water, (e) steam to deaerating heater, (f) to chemical plant, (g) to machine room, (h) to bleach plant, (i) to digester, (j) to acid plant, (k) to 2500 k.w. extraction turbine, (l) condensate from machine room, and (m) return water from digester.

For these important services, a Bristol's Electric Flow Meter is particularly recommended. Among the many features it provides are the following:

BRISTOL'S *ELECTRIC* FLOW METER FOR REMOTE MEASUREMENT OF STEAM, WATER, AIR, GASES, LIQUIDS, AND SOLUTIONS

12-INCH CHART: Easy to read at distance Uniform scale.

SIMPLE TRANSMISSION CIRCUIT: A simple two wire circuit between transmitter and receiver is employed.

RELIABLE ACCURACY: Not influenced by electrical characteristics of circuit. No voltage regulators required.

NO EXPOSED ELECTRICAL CONTACTS: No fire or other hazard. Contacts last indefinitely.

POWERFUL RECORDING MECHANISM: Positive in action.

SENSITIVE MEASURING SYSTEM: responds to every change in rate of flow.

CHART INTEGRATOR: Available for recorders that record the integrated reading on the chart.

SELF-CONTAINED: A rugged, simple, self-contained instrument. Requires no special accessory equipment.

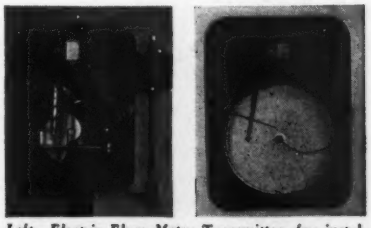
MORE THAN ONE RECEIVER: All may be connected to one transmitter.

RECORDING, INDICATING AND CONTROLLING: All three models available. Recorders and indicators may be equipped with integrators. For wall or flush-panel mounting.

FLEXIBILITY OF TRANSMISSION: Any electric current, of any frequency, suitable for transmission.

UNLIMITED TRANSMISSION DISTANCE: Up to several hundred miles.

MOISTURE-PROOF CASES: Also fume- and dust-proof. Made of corrosion-resisting aluminum alloy.



Left, Electric Flow Meter Transmitter, for installation at remote point where flow is being measured. Right: Electric Flow Meter Recording Receiver, for installation at central headquarters. Indicating Receivers also available.

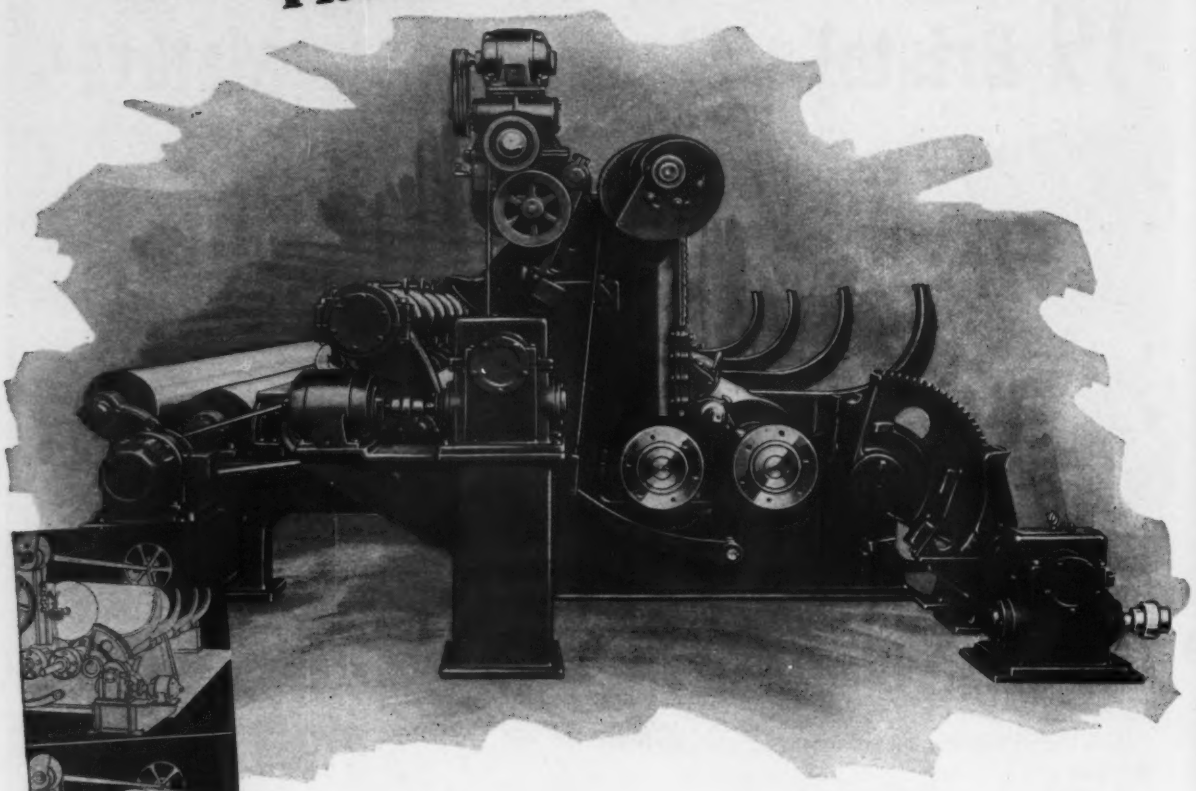
For an explanation of how simply Bristol's Electric Flow Meter works, how easy it is to take care of, as well as for many helpful suggestions and sound ideas on improving your own processing, write for Catalogue 1051H "Bristol's Flow Meters, Electrical and Mechanical".

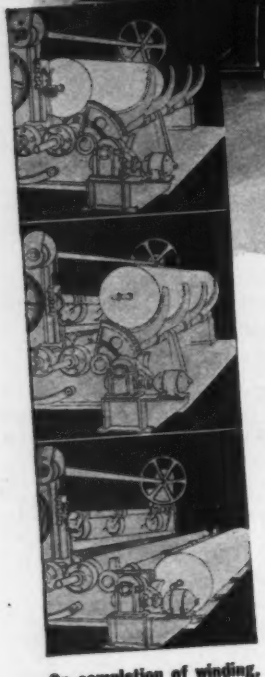
THE BRISTOL COMPANY
WATERBURY, CONNECTICUT
Branch Offices in Principal Cities

BRISTOL'S

TRADE MARK REG. U.S. PAT. OFF.

12 Seconds
FROM WINDER TO FLOOR





On completion of winding, roll is moved from over drums to cradle. It is then lowered to truck or floor. All of these operations are fully automatic.

THE BAGLEY & SEWALL WINDER

"A Masterful Accomplishment"

THIS winder is constructed to meet the most advanced developments of papermaking requirements. It is designed to be a real adjunct to the finest paper machines built--and--its actions speak louder than words. A skillful application of all known principles and requirements of correct paper winding is demonstrated by its performance.

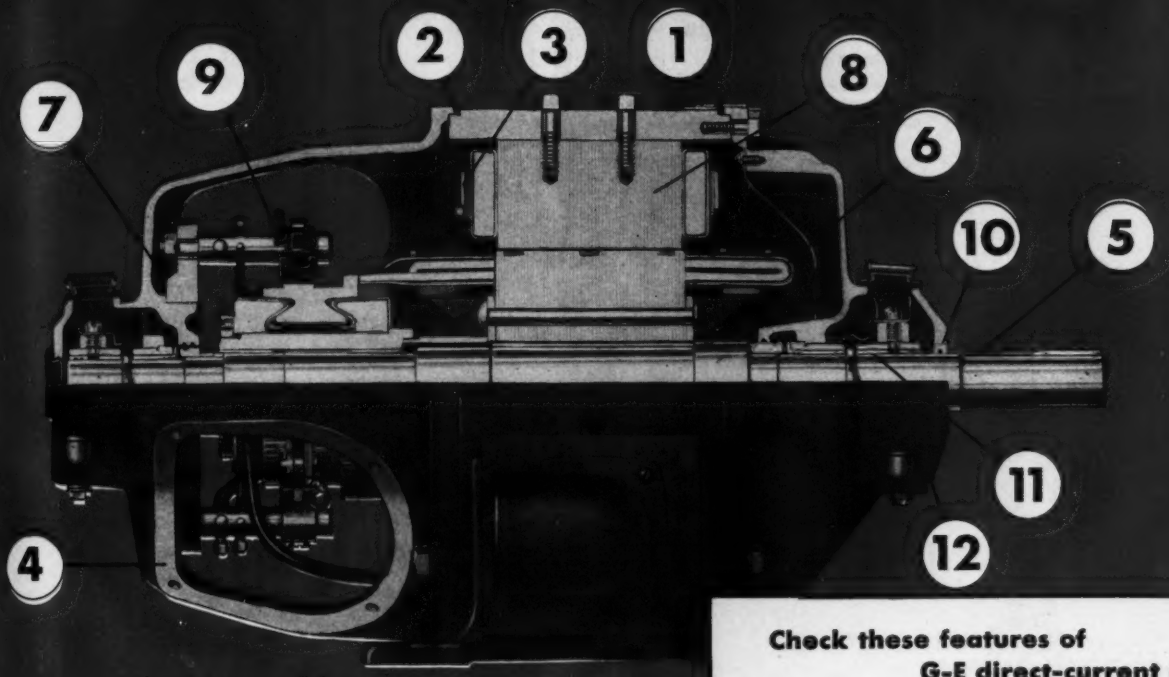
The factor of speed has no bearing on the uniform high quality of production. Regardless of speed this winder will produce the finest rolls without rejections and eliminate one traditional source of trouble in the mill.

A bulletin fully describing the many features of the winder will be gladly sent upon request.

THE BAGLEY AND SEWALL COMPANY - - WATERTOWN, NEW YORK

INSIDE FACTS

Why G-E direct-current motors give long, low-cost service in paper mills



Cutaway view of G-E industrial-type d-c motor

SEE for yourself that there's no mystery behind the excellent performance of G-E industrial-type d-c motors in paper mills.

No mystery—just facts—facts about their design and construction that show why they give years of dependable, low-cost service wherever they're installed. Take a minute and check these facts, remembering that because of space limitations they form only a partial list.

Long bearing life, excellent commutation, a highly protective insulation with remarkable bonding qualities, easily accessible brush rigging, a convenient lubrication system—you find all these advantages in G-E d-c motors.

Remember, too, that these motors are available in a wide variety of standard ratings, speeds, and enclosures to meet all operating requirements. For complete information, just get in touch with the G-E representative nearest you. General Electric, Schenectady, N. Y.

Check these features of G-E direct-current motors:

1. Rolled-steel frame, bored throughout its length, assures uniform air gap and maximum strength.
2. Substantial, 360-degree rabbet fit maintains accurate concentricity and alignment of end shields.
3. Series windings outside shunt, resulting in a better-insulated coil. G-E bonding varnish cements the coils into a solid mass. High resistance to foreign matter prolongs the life of the winding.
4. End-shield openings can be covered with flat plates or screen covers, for which tapped holes are provided.
5. Shaft removable.
6. Form-wound, pretreated coils.
7. Brush yoke clamped in position and easily adjustable.
8. High-grade silicon-steel laminations.
9. Brush holders easily adjusted to maintain proper setting.
10. Grease-filled V-grooves exclude dust and dirt.
11. Steel-shell, babbitted bearing linings.
12. Large oil reservoir.

GENERAL ELECTRIC

SUPERIOR
PMC
CHEMICALS

EXPERIENCED
TECHNICIANS
ARE AT YOUR SERVICE
FOR THE APPLICATION
OF
PMC PREPARED ROSIN SIZE

YOUR ORDER OR INQUIRY WILL BE HANDLED PROMPTLY BY THE NEAREST OFFICE

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WE CAN HELP YOU

WE know whereof we speak because there never has been a Dorr Continuous Recausticizing System that failed to make good on the promises we made for it.

The secret of this success is simple—First correct problem analysis, then correct design and construction and finally, field inspection and supervision of initial operation.

In short, we shoulder full responsibility from the day the order is placed until the plant is turned over to you in full balanced operation.

THE DORR COMPANY INC.

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ITALY: S.A.I. Dorr-Oliver, Milan • JAPAN: Sanki Eng. Co., Ltd., Tokyo • SCANDINAVIA: A.B. Hedemora, Hedemora, Sweden • AUSTRALIA: Crossle & Duff Pty. Ltd., Melbourne
ARGENTINA: Luis Fiore, Buenos Aires • SOUTH AFRICA: Edward L. Bateman Pty. Ltd., Johannesburg • BRAZIL: Oscar Toves & Co., Rio de Janeiro

"every paper mill should consider its merits"

...c Exact-a-Load installed

The advantages of this device as compared with the old fashioned method are many, but we will mention a few of the outstanding improvements.

First The convenience to the operator in knowing at all times just what load he has on the press which can be observed by reference to the chart.

Second Any difference in pressure on front and back can be adjusted at once which, of course, is a saving in paper.

Third The life of the felt is increased by this method of loading.

Fourth More uniform moisture is obtained at the dry end.

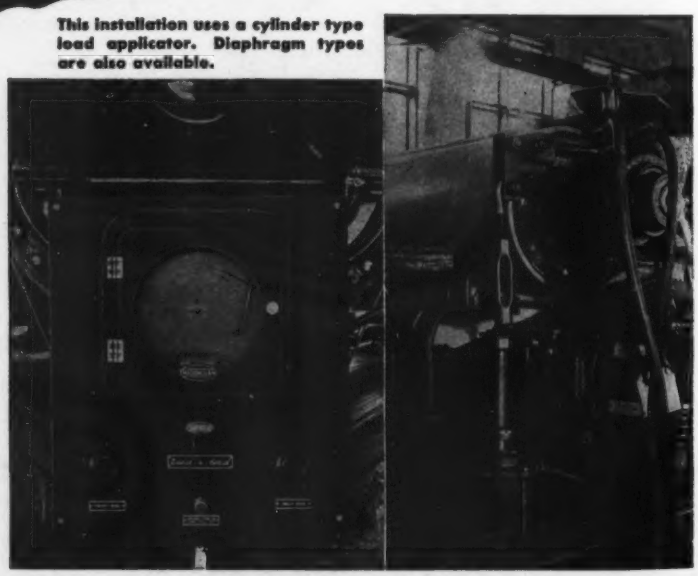
Fifth Saving in felts when crushes occur, as we are able to unload both sides at once, whereas under the old method using weights the unloading takes time and the felt is usually torn before unloading is completed.

In closing we might add that the Exact-a-Load is saving the company money every day and we believe every paper mill should consider its merits.

Very truly yo...

Write today for Bulletin PD-102

This installation uses a cylinder type load applicator. Diaphragm types are also available.



If you are not yet taking advantage of the economies and convenience of this modern method of roll loading, we suggest that you investigate Exact-a-Load immediately. Bulletin No. PD-102 will be sent promptly on request.

MASONEILAN

REG. U.S. PAT. OFF.

MASON-NEILAN REGULATOR CO.

1181 ADAMS STREET, BOSTON, MASS. U.S.A.

NEW YORK BUFFALO PHILADELPHIA PITTSBURGH TULSA
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MASON REGULATOR CO., OF CANADA, LTD., MONTREAL, CANADA

WARREN'S PUMP *AUDIT

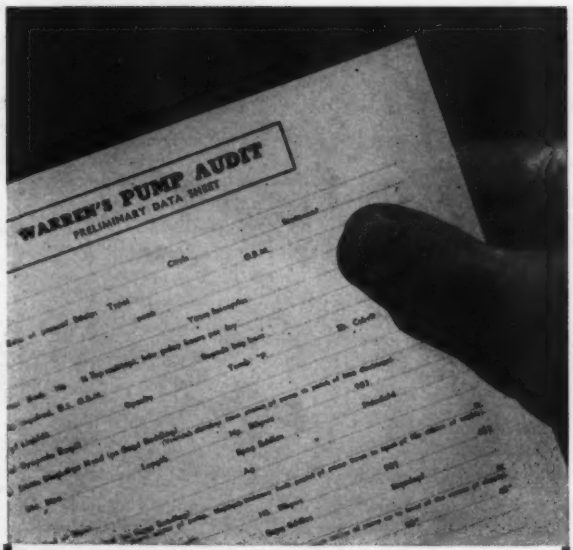
gives you straight facts on pumping costs and how to reduce them

HOW much money can be saved in your mill through improved pump efficiencies?

Warren's Pump Audit will help you answer that important question, and may point the way to power savings that run into money.

A new service to pump users, the Pump Audit is offered exclusively by Warren. It is a simple, practical method designed to (1) put your pump performance *on record*, (2) enable you to compare it with the performance of efficient, modern equipment, (3) provide a sound basis for a replacement program that will pay its way.

If you want the Pump Audit made in your mill without charge or obligation, see your Warren representative or write. And send today for the "P. A. Data Sheet," first step toward savings with the "Pump Audit."



***A valuable new service,** *developed and offered exclusively by Warren, to help pump users improve pump efficiencies and reduce operating costs.*

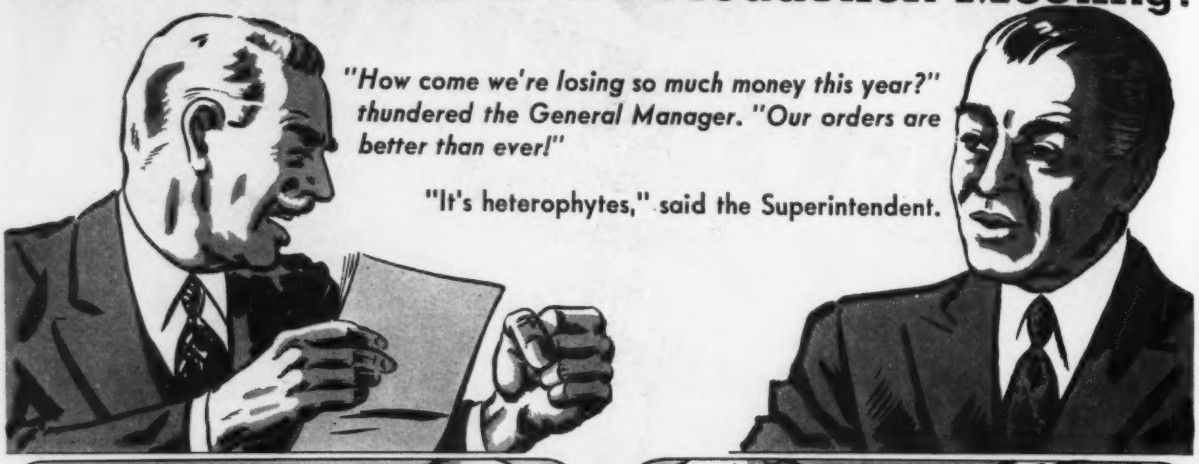
WARREN PUMPS

7446

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS

HETEROPHYTES*

Uninvited Guests at the Production Meeting!



"How come we're losing so much money this year?" thundered the General Manager. "Our orders are better than ever!"

"It's heterophytes," said the Superintendent.

2. *"Don't talk in riddles. This is serious!"*
"I'm plenty serious. The chemist says W&T found heterophytes in our water—they're slime-forming organisms that cause slime breaks, plugged felts, blinded wires, obstructed lines. They may spell the difference between profit and loss!"

3. *"Then let's do something about it!"*
"Our competitors get rid of heterophytes by using chlorine and ammonia, controlled with W&T apparatus."

4. *"How much does it cost?"*
"On an average, from 1½ to 10¢ per ton of product!"
"I'd be willing to invest five times that much to get rid of these whatchamaphytes! Let's get in touch with W&T right away!"

P19

Heterophyte: Any dependent organism which derives its sustenance from dead organic matter, or at the expense of some other living organism . . . . as "parasite" which means literally, "eating at the table of another," or, as "slime-forming microorganisms"— uninvited guests which "eat at the table of the paper manufacturer."

W&T apparatus for banishing slime (and reducing bacterial count in food papers) is employed by over 300 leading mills in the United States, Canada and Europe. For complete information, get in touch with Wallace & Tiernan Co. Inc., Newark, N. J., or the nearest W&T Branch office. Send today for your copy of the latest W&T reprint "Microbiological Control in Pulp & Paper Manufacture." It discusses recent advances in slime prevention methods, including the spectacular new development "BREAK-POINT Chlorination."

WALLACE & TIERNAN CO. Inc.

Manufacturers of Chlorine and Ammonia Control Apparatus

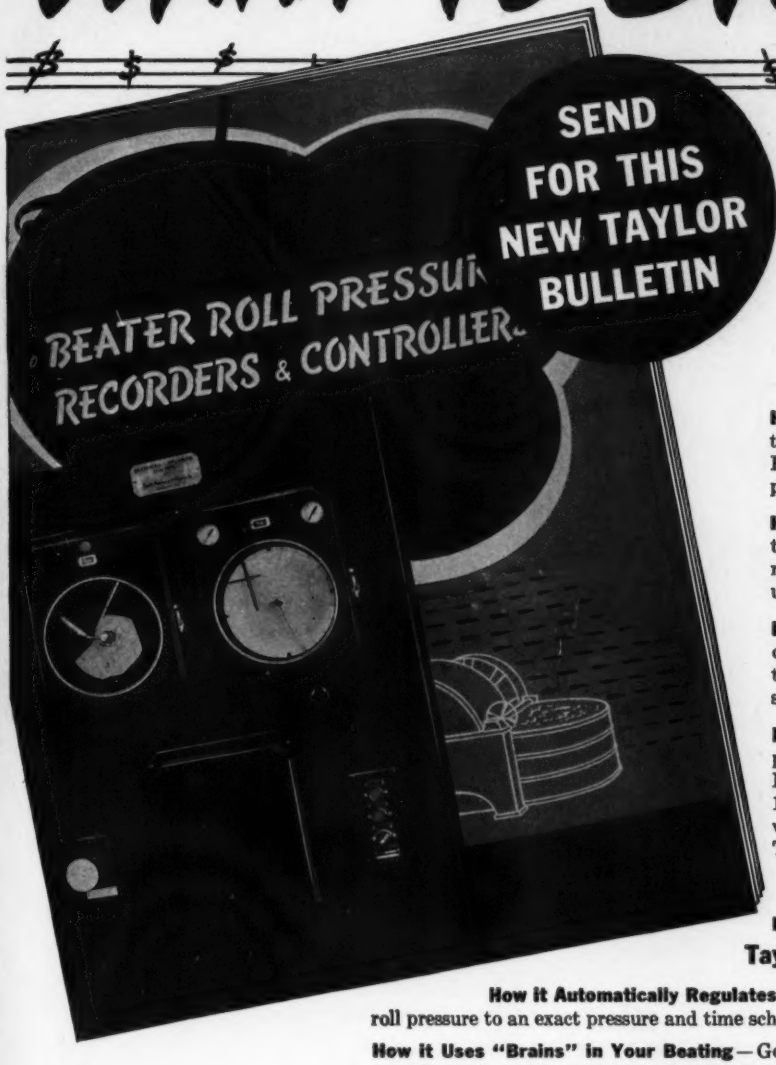
Newark, New Jersey — Branches in Principal Cities

Other W&T Services:

Automatic pH Control · Dry Chemical Feeders · Bleach Plant Equipment

Testing Instruments for Chlorine and pH

WANT TO SAVE?



SEND FOR THIS NEW TAYLOR BULLETIN

Pocketbook News about the *Taylor* Beater Roll Pressure Recorder

How it Saves Time—Actual savings in beating time reported by paper mills using the Taylor Recorder have averaged from 4.8% to 12%—processing has been more uniform than ever!

How it Increases Production—Mills report that they have boosted their beating capacity nearly 5%, without additional equipment—by using the Taylor Recorder.

How it Saves Power—By keeping roll pressures constant and preventing excessive pressures, the Taylor system has cut down power consumption as much as 5½%.

How it Improves Folding—A quality mill reports that the Taylor Beater Roll Pressure Recorder made possible a sheet that withstood 100% more folds than the same sheet when it was made from stock whose beating was *not* Taylor-measured.

PLUS...Pocketbook News about the Taylor Beater Roll Pressure Controller

How it Automatically Regulates—Insuring uniform processing by controlling roll pressure to an exact pressure and time schedule.

How it Uses "Brains" in Your Beating—Governing and changing the beating pressure, regardless of possible shifts in stock density as beating progresses.

How Adaptable It Is—Coming in four distinct types, depending upon your needs and your budget; a complete Taylor Time Schedule Beater Roll Pressure Control System with automatic roll raising feature; the same system with roll raising by hand; a Taylor Beater Roll Pressure Controller with automatic roll raising feature, but no time schedule; and the simplest form, a Taylor Beater Roll Pressure Controller System without automatic roll raising features.

Taylor

Indicating / Recording Controlling

TEMPERATURE, PRESSURE, FLOW and LEVEL INSTRUMENTS

Send to Taylor Instrument Companies, Rochester, N. Y., TODAY for your FREE BULLETIN (No. 98113)

*Your Name*_____

*Address*_____

● For smooth, dependable, low-cost conveying and power transmitting service—use Link-Belt chains. We make all types of malleable iron, Promal, steel, stainless steel, bronze and other alloy chains and are free to recommend the best one for the purpose . . . including sprockets, shafting, bearings, collars, clutches, take-ups, couplings; in fact, everything to make your installation give trouble-free, long-life service.

Today—throughout the world—Link-Belt chains are accepted as the recognized standard. They are backed by 65 years of chain making experience.

Large stocks are carried at Link-Belt plants and warehouses and by authorized distributors.

LINK-BELT COMPANY

The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power

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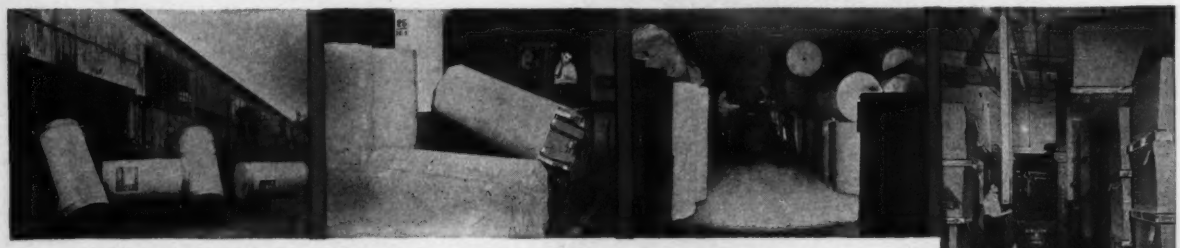
LINK-BELT CHAINS

7946-E

OF MALLEABLE IRON, PROMAL, BRONZE, STEEL, ALLOYS

AN INQUIRY—*Dear Elwell-Parker:*—In handling Pulp (or Paper, or Paper Products) at our Mill, we face this problem * * * * * * * *. We understand you have had a great deal of experience in the Paper Industry. What equipment do you suggest; and what would it do to reduce our costs?

Very truly yours, John J. Progress, *Superintendent.*



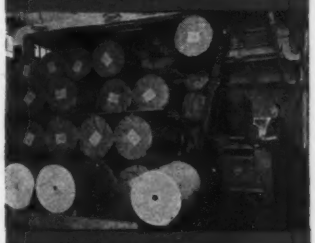
AND THE ANSWER—*Dear Mr. Mill Superintendent:* One of the most satisfactory things that Elwell-Parker has been able to do in its 34 years' experience has been helping the Paper Industry to grow and make money.

By installing Elwell-Parkers in pulp and paper mills, owners have moved larger unit loads faster and more economically than before.

In newsprint plants, large Elwell-Parker Trucks have increased load-capacity, enabling manufacturers to produce wider sheets and manipulate heavy rolls with speed, ease and safety.

Today there is scarcely one load-handling operation in pulp and paper mills, the paper-products industries, newspaper and magazine publishing plants, or large printing plants and binderies, which Elwell-Parker Trucks and Cranes are not performing with speed and economy.

As evidence, we call your attention to pictures showing a few of the hundreds of important jobs that Elwell-Parkers are performing at a profit throughout your industry.



YOUR MOVE NEXT!

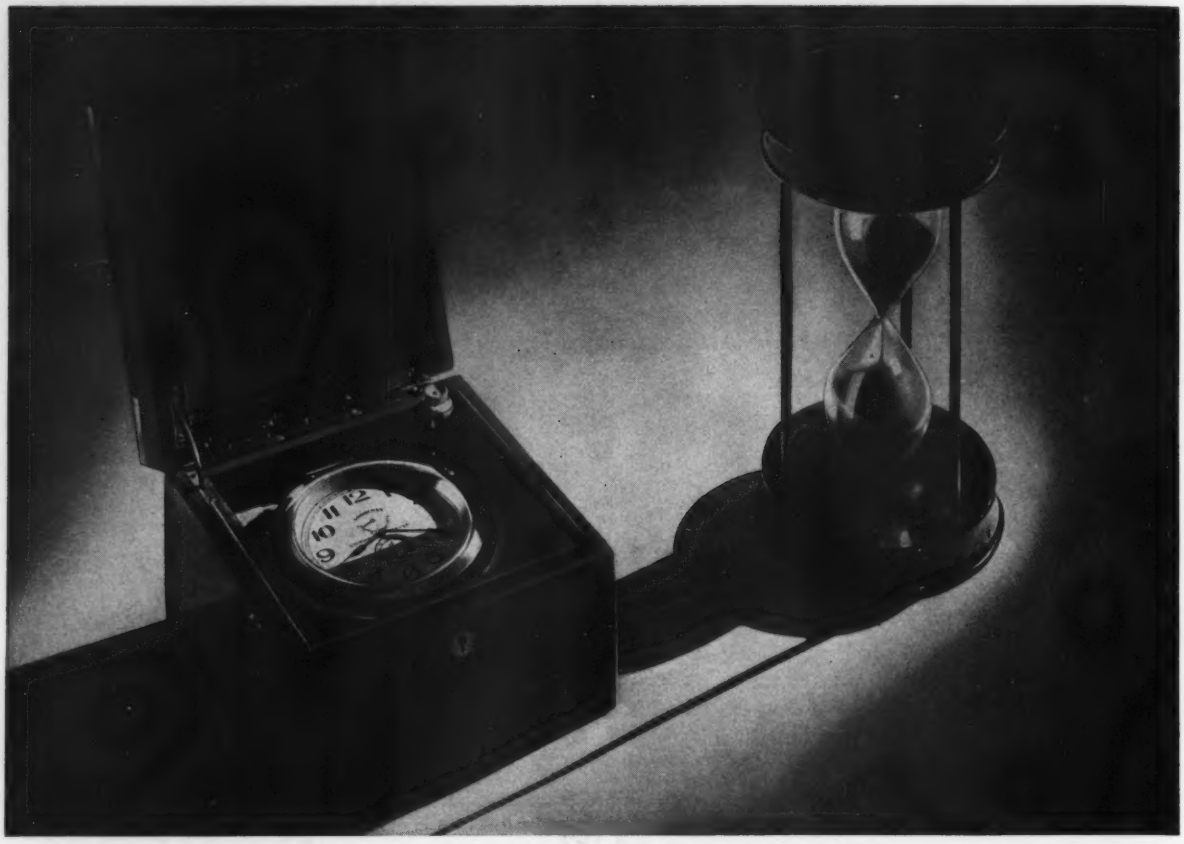
You, too, want first the benefit of Elwell-Parker's long, sound experience building Trucks and Cranes for the Paper Industry; and second the modern equipment that Elwell-Parker today is supplying to the Industry nation-wide. Trained Elwell-Parker Representatives will plan a soundly-developed System—one truck or many—especially designed to earn profits by reducing waste in load-handling under the specific conditions prevailing in your plant.

It's *your* move next!

The Elwell-Parker Electric Company, 4500 St. Clair Avenue, Cleveland, Ohio.

ELWELL-PARKER *Power Industrial* TRUCKS

ESTABLISHED 1893 • BUILDING POWER INDUSTRIAL TRUCKS SINCE 1906



DEPENDABILITY

Few raw materials exert so profound an influence on the finished product as alkalies. Yet the manufacturer of glass, chemicals, paper, soap, textiles, food, drugs and other commodities has to take their quality pretty much for granted, once he has tested the samples on which he based his order. In accepting this responsibility, we strive at all times to make COLUMBIA Alkalies as dependable as time itself.

There are no rotten apples at the bottom of the COLUMBIA barrel. Modern testing equipment plus rigid control and conscientious supervision of every step from mine to consumer insure COLUMBIA users a product of full strength and quality. For dependability in alkalies and liquid chlorine, specify COLUMBIA.

COLUMBIA PRODUCTS for the PAPER INDUSTRY

SODA ASH—For alkali makeup in soda process and kraft mills. For cooking and washing straw and old paper in board mills. Characterized by purity and uniformity. In convenient packages or in bulk.

CHLORINE—For bleaching all types of chemical pulp, for slime control in white water recovery systems. Highest possible purity. Newest and most modern equipment from small cylinders to 30 ton cars.

COLUMBIA

SODA ASH • CAUSTIC SODA • SODIUM BICARBONATE • • •
MODIFIED SODAS • LIQUID CHLORINE • CALCIUM CHLORIDE

THE COLUMBIA ALKALI CORPORATION
EXECUTIVE SALES OFFICES: 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.
Plant: Barberton, Ohio
CHICAGO . BOSTON . ST. LOUIS . PITTSBURGH . CINCINNATI . CLEVELAND . MINNEAPOLIS . PHILADELPHIA

Shooting Pigment Problems Is Our Job

Given a chance, TITANOX pigments will do everything that may be required of them. But the makers of these better pigments don't stop at that. They seek to prove that TITANOX is the logical pigment for economically producing opacity, whiteness and brightness. And how can they prove it more convincingly than by helping paper manufacturers with their various pigment problems?

Whatever your *pigment problems may be, our Service Department will be pleased to give you the benefit of its knowledge and experience.*

We welcome all such problems. We are eager to solve them; for in the solution of each one the superior adaptability of TITANOX is demonstrated.

In the TITANOX Paper Service Laboratory, all paper and pigment problems are approached scientifically—in the light of newest information as developed in our Research Laboratories—not with the idea merely of relieving an individual situation, but rather with the purpose of applying the ever-growing fund of knowledge on which the leadership of TITANOX pigments is founded.

TITANIUM PIGMENT CORPORATION

SOLE SALES AGENT

TITANOX

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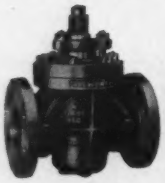
111 Broadway, New York, N. Y.;
104 South Michigan Ave., Chicago, Ill.;
National Lead Co. (Pacific Coast Branch),
2240 24th Street, San Francisco, Calif.

Specify Walworth

FOR POSITIVE CONTROL

Walworth Special Alloy Valves.

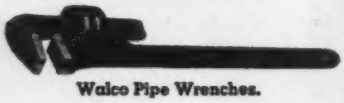
Walworth Bronze Valves.



Walworth Lubricated Plug Valves.

Walworth Swing Check Valves.

Cast Chrome-Nickel-Iron Pipe.



Walco Pipe Wrenches.

Positive control means better production in the making of pulp and paper. That's why Walworth's comprehensive line of valves, fittings and pipe are chosen for use in the pulp and paper industry. Walworth products combine to assure trouble-free, positive operation in the most severe services. Years of experience have qualified Walworth to manufacture valves that, once installed, require a minimum of attention and give maximum life. Let Walworth help you maintain positive control surely and economically. The engineers in Walworth's pulp and paper mill division will be glad to assist you in selecting the valves, fittings, or pipe best suited to your particular requirements.

WALWORTH

VALVES FITTINGS and TOOLS

Backed by 98 Years' Service

WALWORTH COMPANY 60 EAST 42nd STREET, NEW YORK

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

How Much Do You Get For Your SIZING DOLLAR

?

Are you using material that will give you maximum brightness

?

How *little* alum can you use

?

What is the highest pH you can safely carry at your paper machine

?

Are you getting the lowest possible cost per pound of rosin in your present size

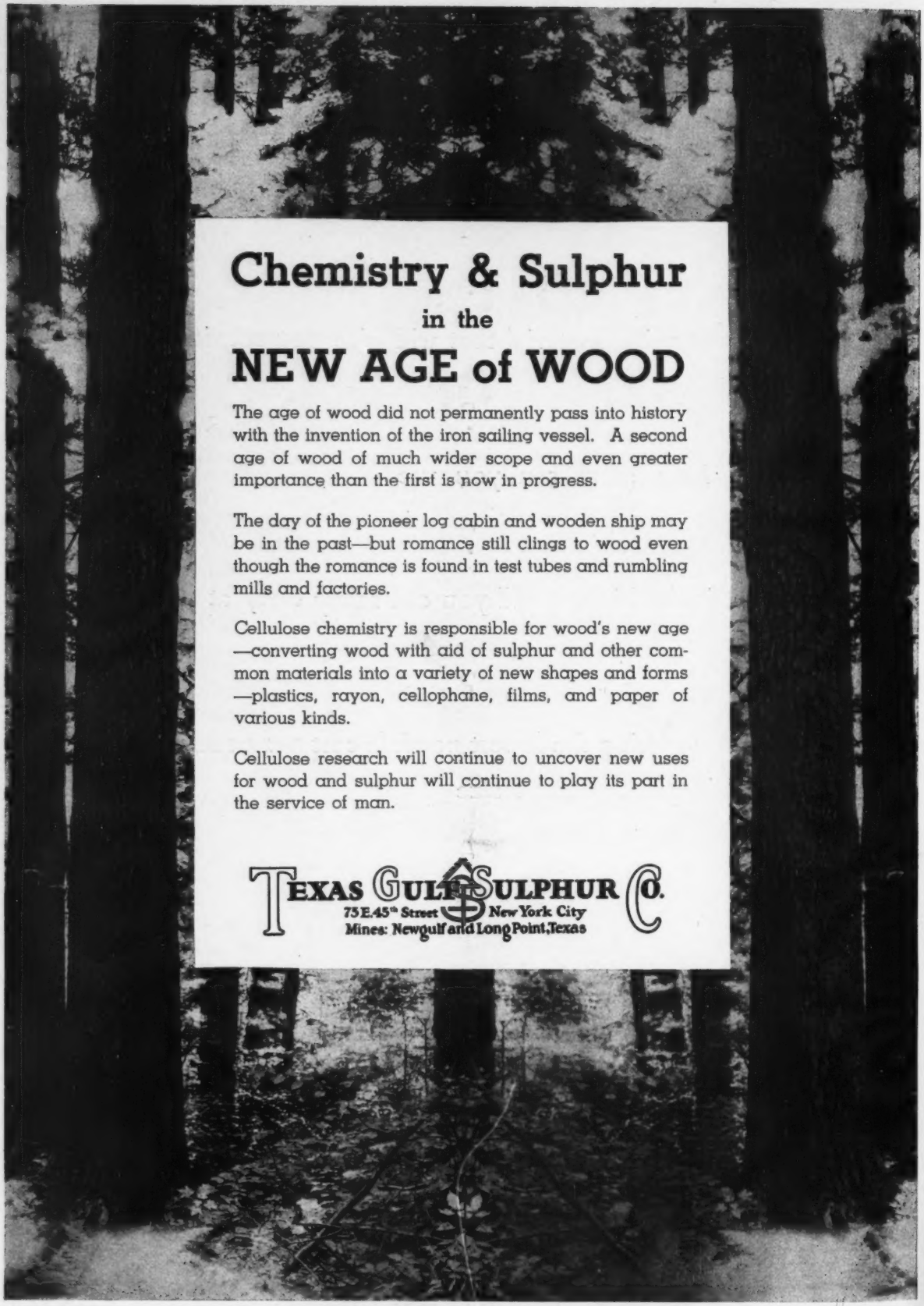
?

At no cost or obligation to you one of our representatives will discuss these matters at your convenience.

AMERICAN BEWOID CO.

295 Madison Avenue, N. Y. C.

Bulkley Dunton Pulp Co., Inc., Sales Agents



Chemistry & Sulphur
in the
NEW AGE of WOOD

The age of wood did not permanently pass into history with the invention of the iron sailing vessel. A second age of wood of much wider scope and even greater importance than the first is now in progress.

The day of the pioneer log cabin and wooden ship may be in the past—but romance still clings to wood even though the romance is found in test tubes and rumbling mills and factories.

Cellulose chemistry is responsible for wood's new age —converting wood with aid of sulphur and other common materials into a variety of new shapes and forms —plastics, rayon, cellophane, films, and paper of various kinds.

Cellulose research will continue to uncover new uses for wood and sulphur will continue to play its part in the service of man.

TEXAS GULF SULPHUR CO.
75 E. 45th Street New York City
Mines: Newgulf and Long Point, Texas

Remember Their Name
You'll Never Forget Their Service

25% to 50%

less FIRST COST IS

only PART OF IT

MOLINE FLIGHT CONVEYORS GIVE YOU 15% TO 25% GREATER CAPACITY, TOO!

● You'd expect to get—and you do get—greater efficiency and economy with Moline Flight Conveyors in handling pulp logs, and hog fuel, etc. They have been built specially for this service. Designed with long link chain which is stronger pound for pound than equivalent "pin type" chains—flights that link integrally into the strand instead of merely fastening onto the chain, and many other proved and exclusive features available nowhere else, Moline Flight Conveyors can operate over long "centers." They avoid the necessity—and cost—of using several shorter conveyors to cover an equivalent distance. They scrape cleaner, avoiding any tendency to ride over the material, and effect other economies and efficiencies so great that they are used regularly by many of the best known and most successful mills in preference to all other conveyors for handling pulp logs, hog fuel, edgings, cuttings, slabs, saw dust, etc. Investigate the cost reducing possibilities of using Moline Flight Conveyors in your mill. A descriptive catalog giving full details, a list of typical users, and other helpful information is available on request. There is no obligation. Send the coupon for a copy of the catalog today.

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FLIGHT CONVEYORS

MOLINE MALLEABLE IRON CO.
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Gentlemen: Without obligating me in any way, please send the illustrated catalog describing Moline Flight Conveyors.

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Company Name _____

Address _____

(7)

SPECIFY PQ SILICATES, FOR MORE REASONS THAN ONE!

All Grades . . .

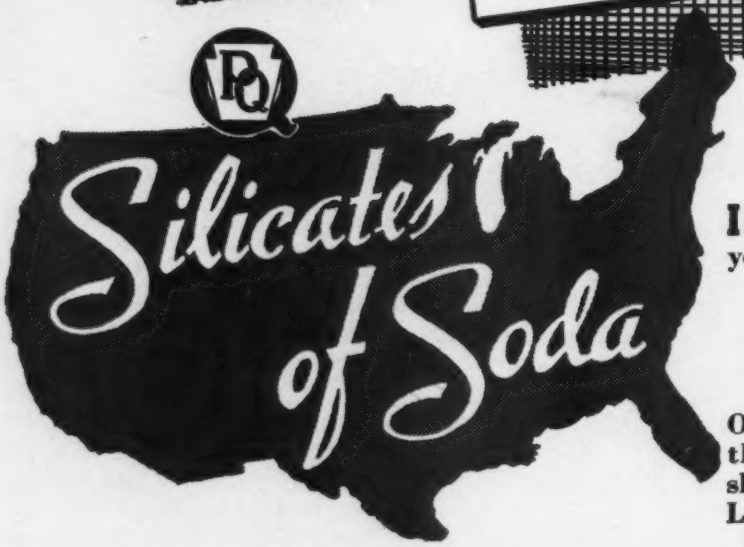
You get the *right* silicate for your use. Since the ratios of its constituents can be varied, sodium silicate is the name of a series of products. PQ has 33 grades for industrial applications. If new commercial processes need other grades, PQ, silicate specialists, can make them.

Valuable Research

You profit from the long, varied PQ experience in adapting silicate of soda to useful purposes — PQ began to accumulate silicate knowledge 75 years ago. We are glad to take up a specific problem with you. If information is given in confidence, we so respect it.

Prompt Deliveries

From coast to coast, wherever you need silicates, you'll find a PQ stock conveniently located. Eleven of our own and affiliated plants in the USA, and one in Canada, plus distributors' stocks in over 65 cities insure deliveries on time. Often that's money saved also.



IN one of your processes, do you need any of these:

Deflocculent	Detergent
Adhesive	Binder
Inhibitor	Colloid
Agent for flocculation	

One of the soluble silicates in the PQ catalog may prove a short cut or an improvement. Let's talk it over.

PHILADELPHIA QUARTZ COMPANY

Established 1831 General Offices and Laboratory: 125 S. Third Street, Philadelphia, Pa.
Chicago Sales Office: Engineering Bldg. Sold in Canada by National Silicates Ltd., Toronto, Ont.

FARREL ROLLS *and* CALENDERS

ENGINEERED for HIGH-GRADE PAPER MAKING

Three outstanding characteristics of Farrel Rolls are important factors in producing uniformly high-grade paper:

(1) Accurate, smoothly finished bodies and journals.
(2) Scientifically correct shape and amount of crown.
(3) Uniform hardness and depth of body chill.

These inherent qualities make Farrel Rolls the choice of paper makers who insist on quality output, dependable, economical service and minimum maintenance.

Over eighty years' skill and experience in roll making go into the manufacture of Farrel Rolls. The highest grade materials are used and every manufacturing step from metal mixture and casting to grinding and inspection is under constant close control.

Farrel Rolls are made in chilled iron or extra hard "Farreloy" in any diameter from 4" to 72", any face length up to 312".

●

Farrel Calender Stacks are designed and built for precision, durability and operating convenience. They are made in any size up to 312" long on the face, equipped with chilled iron or "Farreloy" rolls, automatic lubrication, floor-operated lift and other modern features.

Above—Farrel 228" Ten-Roll Calender Stack with box-type housings, electric lift operated from the floor, fully enclosed boxes and gravity feed lubricating system.

FARREL CALIPERS—Give Accurate Knowledge of Roll Condition. With Farrel Calipers you can determine the exact condition of your rolls. They show the slightest variation in diameter, measure the exact amount of crown. Farrel Calipers move freely on rollers and are easy to handle. Made in five sizes for measuring rolls from 4" to 50" diameter.

FARREL ROLL GRINDERS — Assure Maximum Output, Close Accuracy and Superior Finish. Farrel Two-Wheel, Swing-Rest Roll Grinders are specially designed for grinding long rolls used in paper mills. Their exceptional performance assures maximum output of ground rolls, close and uniform accuracy and a superior finish that aids in the manufacture of high-grade paper.

Exclusive features make results less dependent upon the skill of the operator. Maintenance and depreciation are low due to heavy, durable construction and highest quality materials and workmanship.

FARREL-BIRMINGHAM COMPANY, Inc.

Ansonia, Conn. — Branch Offices: New York - Buffalo - Pittsburgh - Akron - Chicago - Los Angeles

SINCE 1828—FINER PAPER MILL MACHINES

PAPER MILL MACHINERY

Straight, Harper and Edwards Fourdriniers—For book, bond or fine tissues.

Cylinder and Wet Machines. Jordans — Pumps — Calenders "Rainstorm Shower Pipes."

●

Below:
THREE PLUNGER STUFF PUMP

For the Finishing Room
UNDERCUT TRIMMER

Electric Eye Web Edge Control — Slitters — Reels — Rotary Cutters.

●

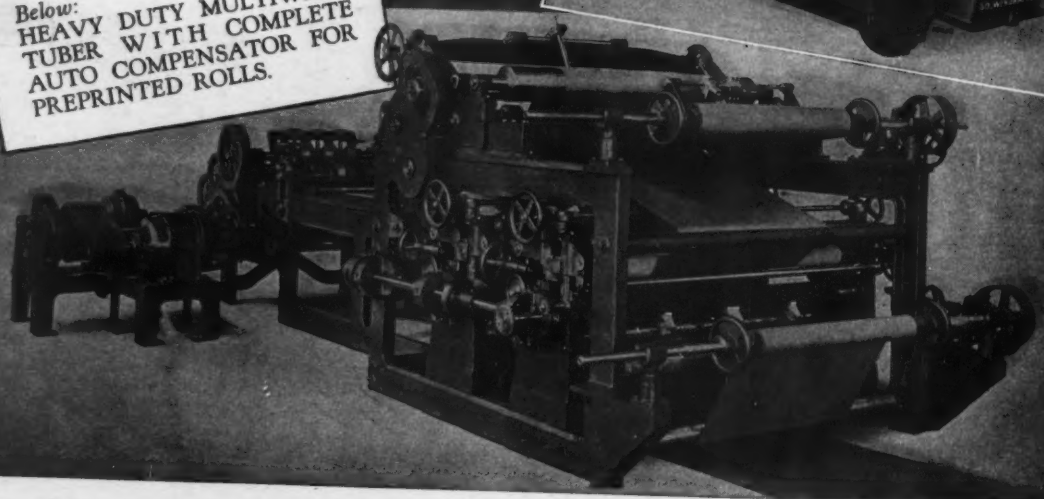
Above:
ROTARY SPOT CUTTER

FOR BAG PLANTS

Flat, square and satchel bottom bag machines—single and multi-wall pasted valve bag machines—tuber and bottomer type bag conveyors.

●

Below:
HEAVY DUTY MULTIWALL TUBER WITH COMPLETE AUTO COMPENSATOR FOR PREPRINTED ROLLS.

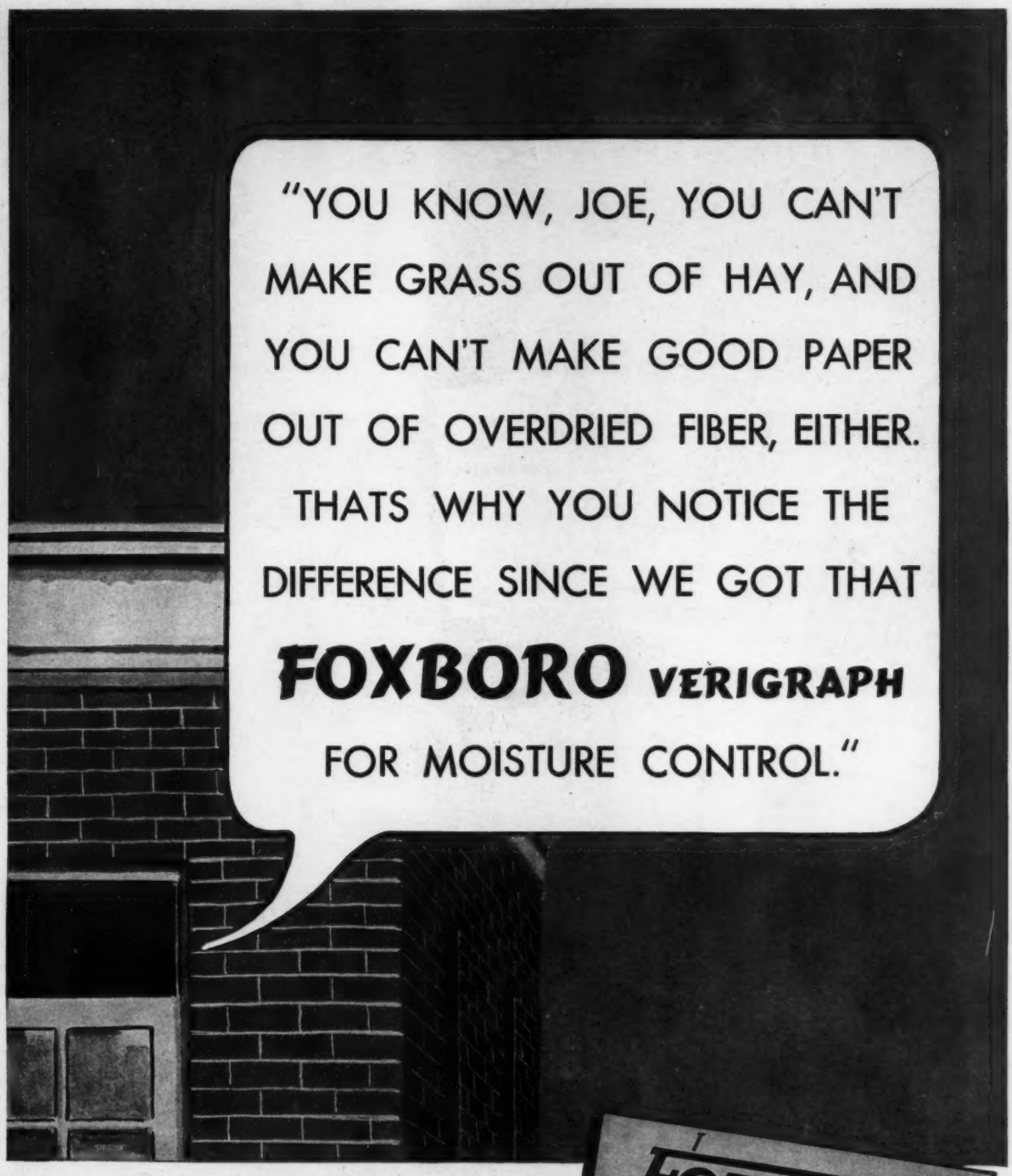


The SMITH & WINCHESTER

Manufacturing Company

1828

PLANT AND OFFICES AT SOUTH WINDHAM, CONNECTICUT


"YOU KNOW, JOE, YOU CAN'T MAKE GRASS OUT OF HAY, AND YOU CAN'T MAKE GOOD PAPER OUT OF OVERDRIED FIBER, EITHER. THATS WHY YOU NOTICE THE DIFFERENCE SINCE WE GOT THAT FOXBORO VERIGRAPH FOR MOISTURE CONTROL."

Try eavesdropping some day around a plant where Foxboro instruments are at work, and it's a safe bet you'll hear something that adds up to the same thing: *Because Foxboro has the edge in practical performance, Foxboro gets the vote of the men in the plant.*

FOXBORO
REG. U. S. PAT. OFF.
Instrumentation
Controlled ACCURACY RESPONSE
TEMPERATURE • LIQUID LEVEL
PRESSURE • FLOW • HUMIDITY

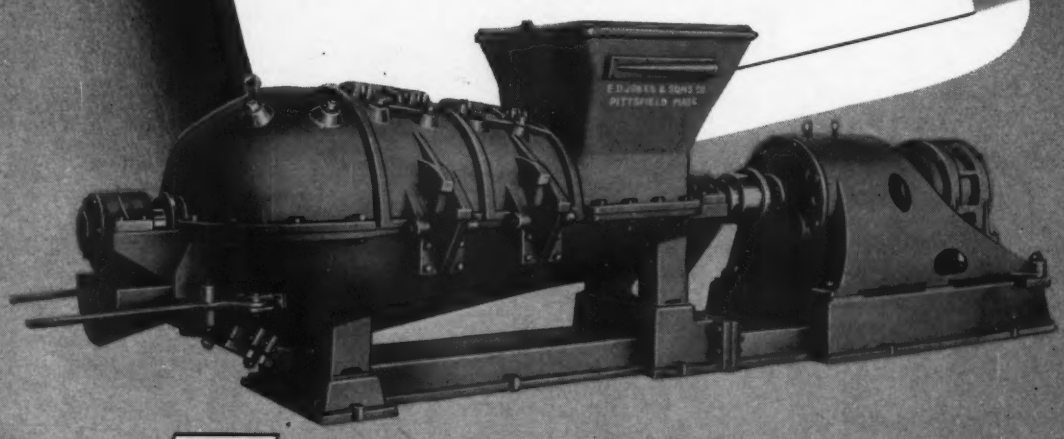
THE FOXBORO CO., 114 NEPONSET AVE., FOXBORO, MASS., U.S.A. • BRANCHES IN 25 PRINCIPAL CITIES

THE JONES PULPER

The Jones Pulper de-fibres lapped or sheeted pulps, rejects and waste quickly, efficiently and at a very low cost. Handles large or small capacities while retaining original fibre characteristics as fed to the Pulper. An ideal utility machine in scores of mills.

Also adaptable for use with de-inking systems... for quick, economical utilization of old papers.

For full particulars, write for Pulper Bulletin.



Jones

E. D. JONES & SONS COMPANY-PITTSFIELD, MASS.
Builders of Quality Machinery for Paper Mills

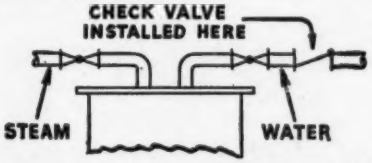
"Accidents like this can cost us a fortune," excitedly shouted the PLANT SUPERINTENDENT.

"How in blazes did steam get into that drinking fountain," woefully spoke the MAINTENANCE FOREMAN.

"But it won't happen again," assured the CRANE MAN. "Preventive Maintenance will see to that."

IN a midwestern manufacturing plant one day, a worker went for a drink. But, as he stooped over the fountain, instead of refreshing water, there came a blast of burning, blinding steam.

In another department, silicate of soda used for processing was melted in a large vat with a steam coil. The liquid was then cooled by running water through the same coil. A globe valve in each line controlled the water and steam to the coil. The water connection came direct from a 2½-inch main line which supplied the entire building.



A batch of the processing material had been melted and was ready for cooling. The water valve was opened wide. But, the operator forgot to close the steam valve. The 160-pound steam easily forced its way into the water line. And, it was the thirsty worker who provided an outlet for the angry vapor.

"This must never happen again!" said the Superintendent. A warning to the vat handlers wasn't enough. So he called in W. F. C., the Crane Man, who suggested Preventive Maintenance. The solution to the problem was simple, yet Preventive Maintenance would safely guard against recurrence. It counseled the installation of a Crane No. 74E Brass Check Valve in the water line to the processing vat.

Results: (1) the trouble was permanently remedied. (2) The management has peace of mind about the safety of its employees from this danger. (3) Another manufacturer has learned the sound economy of Preventive Maintenance. Has learned, too, to look to Crane for the valves and fittings for the most economical solution to every piping problem. And, he knows it pays to consult the Crane Representative—always.

This case is based on an actual experience of a Crane Representative in our Kansas City Branch.

CHECK VALVES ARE "TRAFFIC COPS" IN PIPE LINES

In industry there are few piping systems, if any, in which backflow is not dangerous or damaging. Thus check valves are often the most essential valves in a line. They police your piping—keep flow going in the right direction.

Systems lacking adequate backflow control afford the Plant Engineer a valuable opportunity to apply Preventive Maintenance now—before costly damage results to product or equipment, or harm to personnel. To meet the varying operating conditions of industrial piping, Crane makes check valves in a complete range of designs and materials—for all working pressures.

You'll get a lot of satisfaction in Crane No. 74E Brass Check Valves. They're rated at 300 pounds steam, 550°, and are built to give superior service. For steam, water, oil or gas lines, they're an outstanding buy. Consult your Crane Representative.

1940 our 85th YEAR

CRANE

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

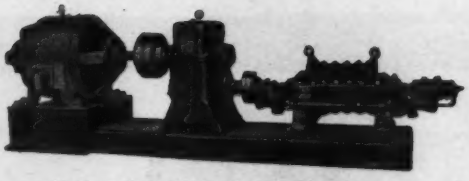
NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

WEST COAST HEMLOCK PULP

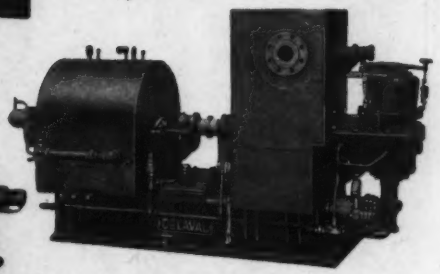
A TOWER SKIDDER at the track supports one end of the "skyline" along which incoming logs are hoisted and placed within reach of the loading boom.

PULP DIVISION ‡ WEYERHAEUSER TIMBER COMPANY

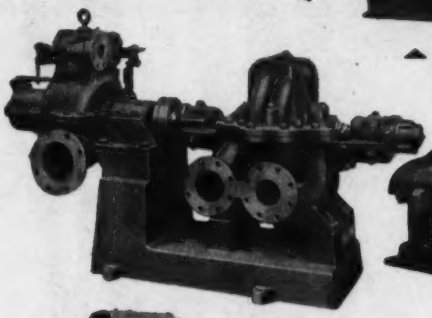
Turbine-driven two-stage series pump; 1000 g.p.m. of 210° water against 350 lb. gage at 3500 r.p.m. The turbine receives steam at 270 lb. gage with 50° F. superheat and exhausts against 60 lb. back pressure.

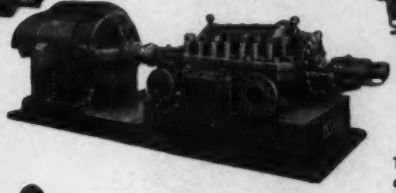


One of 24 turbine-driven boiler feeders for new 18-knot bulk oil tankers; 300 g.p.m. each of 235° F. water against 575 lb. per sq. in. at 4000 r.p.m. The turbine receives steam at 425 lb. gage and 500° F. and exhausts to a feed heater at 10 lb. gage.

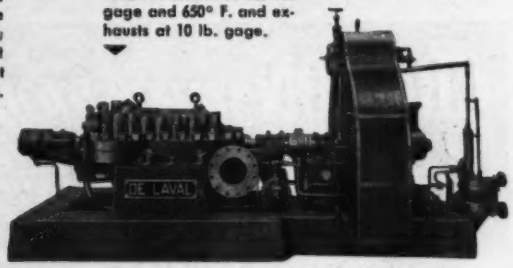


Six-stage boiler feed pump driven at 4000 r.p.m. through helical gear from 1800 r.p.m. motor; 125 g.p.m. of 218° F. water against 525 lb. per sq. in.





Turbine-driven six-stage boiler feed pump; capacity 850 g.p.m. of 220°F. water against 1600 lb. pressure at 3550 r.p.m. The turbine receives steam at 385 lb. gage and 650° F. and exhausts at 10 lb. gage.

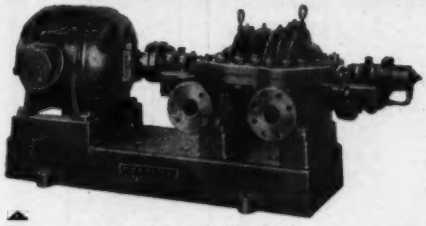


Motor-driven six-stage boiler feeder; 800 g. p. m. at 227° F. against 850 lb. per sq. in.

One of two turbine-driven boiler feed and booster units; 1455 g.p.m. each against 1186 lb.

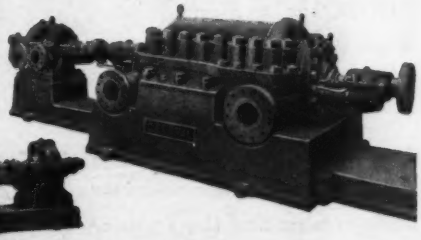
FEED PUMPS for Modern Boilers

DE LAVAL builds them



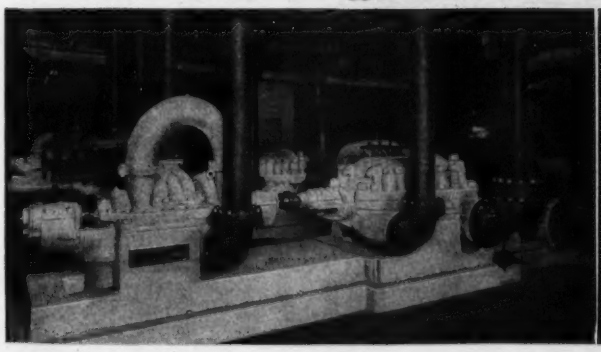
Four-stage motor-driven boiler feed pump; 28 g.p.m. against 375 lb., handling 210° F. water at 3500 r.p.m.

One of seven motor-driven and seven turbine-driven boiler feed and booster units; including capacities from 647 to 1320 g.p.m. of 300° F. water against pressures of 880 to 910 lb. at 1780 r.p.m. with 107 lb. pressure on the suction.

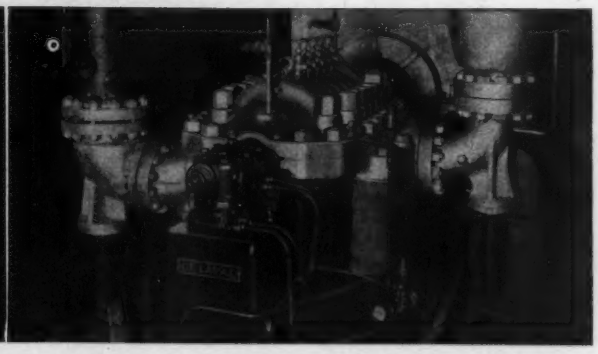


Motor-driven seven-stage pump with two-stage booster pump; 1200 g. p. m. against 1200 lb. at 1785 r.p.m.

3614



Two turbine-driven and one motor-driven combination boiler feed and primary pump unit; capacity 1455 g.p.m. each against 1186 lb. gage discharge pressure.



Motor-driven boiler feeder; 800 g.p.m. of 210° F. water against 1400 lb. This unit has had 40,000 hrs. of continuous service.

Ask for Catalog B-5 • De Laval Steam Turbine Co., Trenton, N. J.

Cut Corrosion— Reduce Wear!

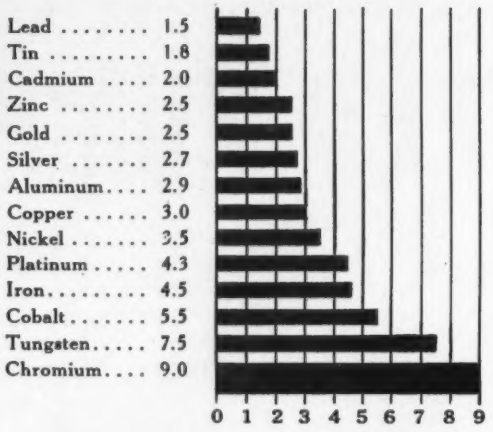
CRODON *saves money Increases Profits!*

CRODON-plating your equipment helps you dispose of many operating and maintenance problems. Chromium, hardest of commercial metals, assures exceedingly hard, smooth, easily-cleaned surfaces — your CRODON-plated equipment can't help but last longer, retain its new-equipment performance, and do a more perfect job.

See how CRODON cuts your maintenance costs. It reduces the expense and inconvenience of frequent replacements and the resulting delay — reduces also the percentage of defects due to contact with worn, faulty surfaces. At the same time, it improves the quality of your product through more permanently perfect performance.

Comparative Hardness of Metals . . .

(MOH'S SCALE)



The CRODON trademark is your assurance of the best chromium plating and thoroughly expert application — practical, economical, completely serviceable. The CRODON name assures you of service backed by the experience and reputation of the oldest and largest industrial chromium plating organization in America.

Let us show how CRODON-plating can help you solve your maintenance and cost problems. Write for full information.

CRODON PLATING *pays*

CHROMIUM PLATING

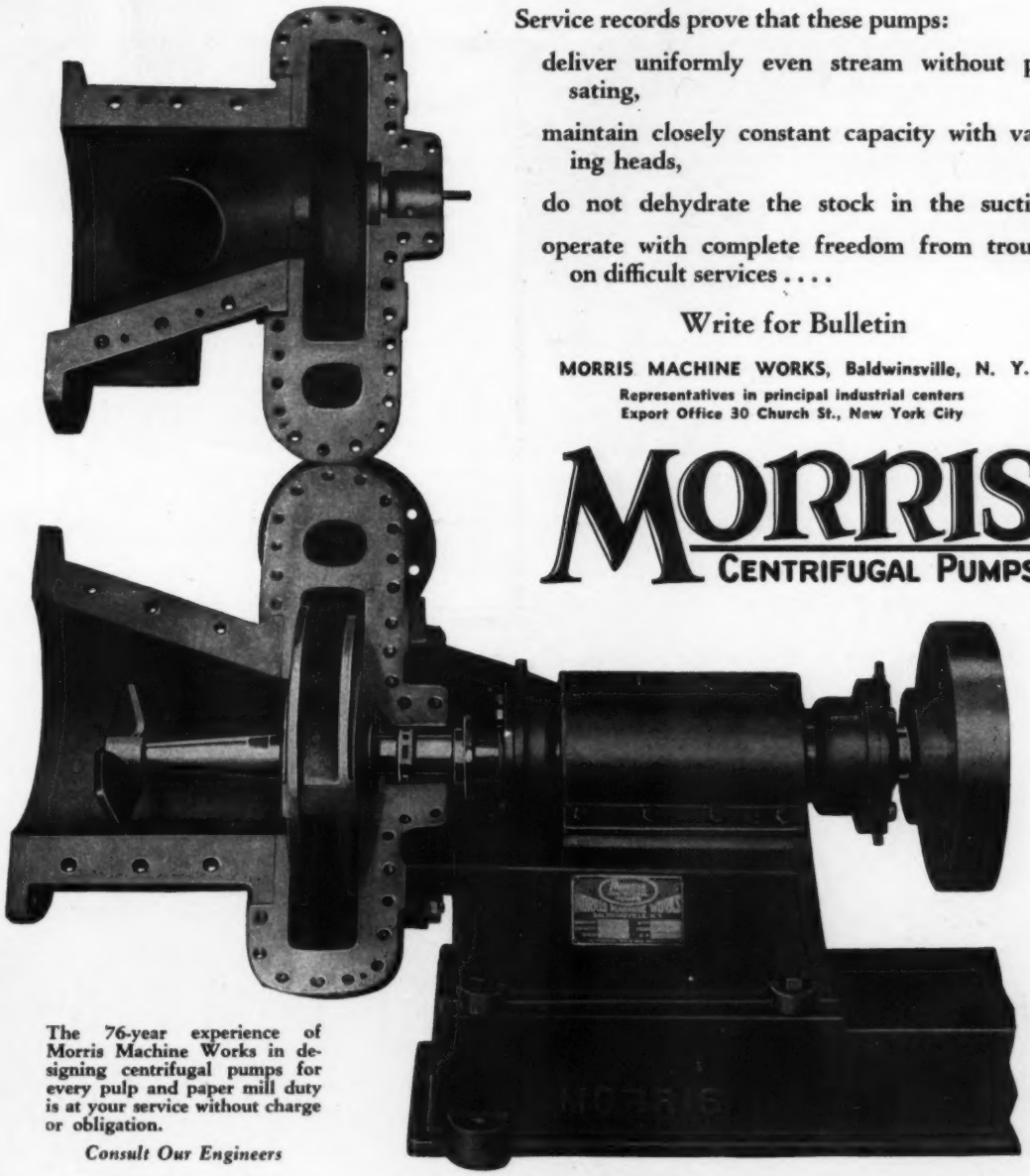
CHROMIUM CORPORATION OF AMERICA

Executive Offices . . . 120 Broadway, New York

346 Huntingdon Avenue, Waterbury, Conn. | 1760 Lakeview Road, Cleveland, Ohio | 4645 West Chicago Avenue, Chicago, Ill.

Worth looking into

This Morris ST-P Stock Pump is GUARANTEED to be non-binding and non-clogging when handling long-fibre, waste paper, or rag stock.



Service records prove that these pumps:

deliver uniformly even stream without pulsating,

maintain closely constant capacity with varying heads,

do not dehydrate the stock in the suction,

operate with complete freedom from trouble on difficult services . . . .

Write for Bulletin

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

Representatives in principal industrial centers
Export Office 30 Church St., New York City

MORRIS
CENTRIFUGAL PUMPS

The 76-year experience of Morris Machine Works in designing centrifugal pumps for every pulp and paper mill duty is at your service without charge or obligation.

Consult Our Engineers

RUNNING LOW ON SAP BROWN?

Write today for a sample of FAST PAPER BROWN—DBS

Change to FAST PAPER BROWN—DBS!

FAST PAPER BROWN—DBS is a new H & M color developed specifically to meet the growing shortage of the imported color, Sap Brown.

It is in powder form only for beater dyeing—and perfectly suited to all the uses for Sap Brown. Fast Paper Brown—DBS is nearly equal to Sap Brown in light fastness and is slightly yellower in shade. Its strength is nearly two and a quarter times that of Sap Brown.

Our laboratory and technical staffs will, of course, gladly cooperate with your own people in revising your present formulas to employ Fast Paper Brown—DBS most effectively.

Samples and prices will be furnished on request. Please write on your firm letterhead to Heller & Merz, Dept. D, 90 West Street, New York City.

For Color in Paper it's

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Calco — Heller & Merz Products

Division of THE CALCO CHEMICAL CO., INC., Bound Brook, N. J.
A Division of American Cyanamid Company

standardized dyestuffs

FOR ALL PAPER MILL REQUIREMENTS

A COMPLETE RANGE OF BEATER COLORS

CALENDER COLORS AND AUXILIARIES

GDC

GENERAL DYESTUFF CORPORATION

435 HUDSON STREET, NEW YORK, N. Y.

BOSTON • PROVIDENCE • PHILADELPHIA • CHICAGO • CHARLOTTE • SAN FRANCISCO

The Nekoosa Portable Wood Peeler Has a Large Capacity

Peeling 100-inch Balsam at the rate of seven cord per hour.

The Nekoosa Peeler has cleaned as high as 60 cord of 100″ wood per eight hours, in practical woods operation and for several days at a stretch. Capacity naturally will vary somewhat with the size and length of wood. Also the condition of the bark will have a direct bearing on the capacity. Those who have seen the machine in operation, however, pronounce the large capacity as a truly remarkable feature.

Nekoosa Foundry & Machine Works, Inc.

NEKOOSA, WIS., U. S. A.

Aids to *Better Quality* . . . and LOWER OVERALL COSTS

Slime takes a constant toll in poor quality and production delays—
Poorly washed felts function sadly and quickly wear out—
Clogged suction rolls reduce the production rate of the machines—
Sticky sizes on the doctor rolls mean further production troubles—
These and other daily problems of the paper mill are the reason for

MAGNUS CLEANERS for Paper Production

—Each designed to tackle and end one of these definite problems. Magnus Slime Remover ends slime troubles thoroughly and economically. Magnus Feltex insures soft, absorbent, long-lived felts. Magnus Suction Roll Cleaner quickly cleans suction roll holes. Magnus 58 Soap added to size eliminates stickiness.

Make use of these aids to better production. Try them out! Write for details on our trial offer!

OTHER MAGNUS SPECIALTIES

MAGNUS BEATEX—Speeds up beater performance by improving wetting and penetration. Insures better formation.

MAGNUSOL—The perfect all around cleaner for oily and greasy metal parts.

MAGNUS CHEMICAL COMPANY

Manufacturers of Industrial Soaps, Cleaning Materials, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants

24 South Avenue — Garwood, N. J.

MAGNUS CLEANERS

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, June 26, 1940.

BLANC FIXE—Prices on blanc fixe are firm and continue unchanged at prevailing market quotations. The pulp is currently quoted at $35 per ton, in barrels, at works; the powder is offered at $50 per ton, in bags, f.o.b., works.

BLEACHING POWDER—Quotations on bleaching powder are reported firm. Demand fair. Quotations unchanged. Bleaching powder is currently quoted at $2 per 100 pounds, in drums, at works.

CASEIN—Prices on casein are unchanged for this week. Standard domestic casein, 20-30 mesh, is currently quoted at from 13 to 14 cents per pound; 80-100 mesh, at from 13½ to 14½ cents per pound. All prices in bags, car lots. Argentina casein as currently quoted at 12 cents per pound; French casein at 15 cents per pound is nominal.

CAUSTIC SODA—Quotations on caustic soda are firm and conform to prevailing market levels. Demand moderate. Solid caustic soda is currently quoted at $2.30 per 100 pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Prices on china clay are firm and continue to conform to prevailing market quotations. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is currently quoted at from $13 to $25 per long ton, ship side.

CHLORINE—Quotations on chlorine are firm. Market strong. Prices unchanged. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported firm with prices slightly higher for the week. "G" gum rosin is currently quoted at $4.00 per 280 pounds, gross weight, in barrels, Savannah. "FF" wood rosin is currently quoted at $4.00 per 280 pounds, gross weight, in barrels, New York. Seventy per cent gum rosin size is currently offered at $2.45 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Prices on salt cake are firm and nominal and unchanged for the week. Domestic salt cake shipments are reported steady. Domestic salt cake is currently quoted at $17 per ton, in bulk; chrome salt cake at $16 per ton. All prices in car lots, f.o.b., shipping point. Imported salt cake, quoted at $20 per ton, is nominal.

SODA ASH—Quotations on soda ash are firm and continue to conform to prevailing market levels. Demand moderate. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Prices on corn starch are firm and unchanged for the week. Pearl is currently quoted at $2.80 per 100 pounds; powdered starch at $2.90 per 100 pounds. All prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm. Shipments continue steady for the week. The commercial grades are currently quoted at $1.15; iron free at $1.60 per 100 pounds. All prices in bags, car lots, f.o.b., works.

SULPHUR—Prices on sulphur are firm and continue to conform to prevailing market quotations. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $19 per ton.

TALC—Prices on talc are firm and continue unchanged at prevailing market levels. Domestic talc is currently quoted at from $15 to $21 per ton, at mines. Prices on imported talc are nominal.

MARKET QUOTATIONS

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00	"	—
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$5.25	@	$5.75
Superstandard	4.87½	"	5.25
Northern Standard Wrapping	4.37½	"	4.62½
Standard Wrapping	4.25	"	—
Tissues—Per Ream—Carlots			
White No. 1	.97½	"	—
White No. 1 M. G.	.95	"	—
White No. 1½	.80	"	—
White No. 2	.75	"	—
Anti-Tarnish M. G.	.80	"	—
Colored	.85	"	—
Kraft	.87½	"	—
Manila	.77½	"	—
Unbl. Toilet, 1 M.	3.75	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.10	"	—
Bleached, Jr.	3.60	"	—
Manila—per cwt.—C. l. l. a.			
No. 1 Jute	8.25	@	10.25
No. 1 Manila Wrapping, 35 lb.	5.25	"	—
No. 2 Manila Wrapping, 35 lb.	5.00	"	—
Boards, per ton—			
News	35.00	@	40.00
Chip	35.00	"	40.00
Sgl. Mia. Ll. Chip	55.00	"	57.00
White Pat. Coated	67.00	"	70.00
Kraft Liners	55.00	"	—
Binders Boards	73.00	"	80.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds		Ledgers	
100% Rag Ext. No. 1	$39.10 @ $46.00		$40.25 @ $47.25	
100% Rag	31.05	" 36.50	32.20	" 37.75
85% Rag	....	"	29.90	" 35.00
75% Rag	23.60	" 27.75	24.75	" 29.00
65% Rag	....	"	21.65	" 26.25
50% Rag	17.55	" 21.50	18.70	" 22.75
25% Rag	14.65	" 17.75	15.80	" 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds		Ledgers	
No. 1	$8.95 @ $11.00		$10.10 @ $12.25	
No. 2	8.05	" 9.75	9.25	" 11.25
No. 3	7.60	" 9.25	8.50	" 10.75
No. 4	7.30	" 9.00	8.50	" 10.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—
White, Cased Paper,

Delivered in Zone 1:

No. 1 Glossy Coated	$11.90 @ $13.50		
No. 2 Glossy Coated	10.35	"	11.75
No. 3 Glossy Coated	9.55	"	11.00
No. 4 Glossy Coated	9.15	"	10.50
No. 1 Antique (watermarked)	8.35	"	9.50
No. 2 Offset	7.70	"	9.00
A Grade E. F.	7.50	"	8.75
A Grade S. & S. C.	7.75	"	9.00
B Grade E. F.	6.95	"	8.00
B Grade S. & S. C.	7.20	"	8.25
C Grade E. F.	6.65	"	7.75
C Grade S. & S. C.	6.90	"	8.00
D Grade E. F.	6.40	"	7.50
D Grade S. & S. C.	6.65	"	7.75

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	Nominal		
Dry	Nominal		
(Delivered)			
No. 1 Domestic and Canadian	40.00	@	45.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.72½	@	4.50
Prime Qualities—			
Easy-Bleaching Sulphite	3.17½	"	3.75
Strong Unbleached Sulphite	3.17½	"	3.75
(On Dock, Atlantic Ports)			
Kraft Bleached	4.00	"	4.50
Kraft Light & Strong	3.50	"	3.75
Kraft No. 1	3.25	"	3.60
(F. o. b. Pulp Mill)			
Kraft Domestic and Canadian	3.25	"	3.60
(Delivered)			
Soda Bleached	2.90	"	3.30

Add 60 cents per short ton, dock charges for Albanay; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	7.00	@	7.25
Silesias No. 1	4.60	"	4.75
New Unbleached	6.75	"	7.00
Blue Overall	4.50	"	4.75
Fancy	3.25	"	3.50
Washables	2.00	"	2.15
Mixed Khaki Cuttings	2.75	"	3.00
O. D. Khaki Cuttings	3.15	"	3.35

Old Rags

White, No. 1—			
Repacked	3.25	"	3.50
Miscellaneous	2.75	"	3.00
White, No. 2—			
Repacked	2.50	"	2.75
Miscellaneous	2.00	"	2.25
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.75	"	1.90
Roofing Rags—			
No. 1	1.10	"	1.15
No. 2	.85	"	.90
No. 3 (bagging)	.90	"	1.00
No. 4	.60	"	.65
No. 5A	.60	"	.65

Foreign Rags

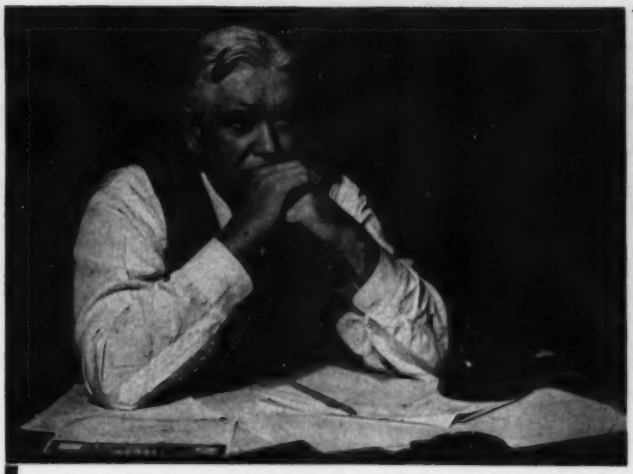
All prices nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxford	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—



ARE YOU THIS MAN?

~ faced with Pulp Problems!

~ New Paper Specifications!

~ Increasing Costs!

Each day brings new problems to paper mill superintendents and their technical staffs. ★ The proper choice and application of starch and starch products can do much to lighten these new burdens. And many mill men have found that Stein-Hall, with its extensive laboratory facilities and its highly trained technical staff, has been able to provide valuable assistance in this field. ★ Because of their broad experience in mills working on all types of papers, Stein-Hall technical men are well equipped to advise you how the new developments in starch can be used to cut costs and achieve the results you are after. ★ Their services are at your disposal without obligation.

Write or wire at our expense.

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285 Madison Avenue, New York

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STEIN-HALL MFG. COMPANY
2841 S. Ashland Avenue, Chicago

Suppliers To The Paper Industry Since 1866

Founders: STEIN-HALL RESEARCH FELLOWSHIP, at the Institute of Paper Chemistry at Appleton, Wisc.

APPLETON WIRES are GOOD WIRES

APPLETON WIRE WORKS, INC.
APPLETON, WIS.

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	"	4.75
No. 2 White Cotton.	3.25	"	3.75
No. 3 White Cotton.	2.50	"	3.00
No. 4 White Cotton.	1.90	"	2.20
Extra Light Prints..	2.00	"	2.40
Ord. Light Prints...	1.75	"	2.15
Med. Light Prints...	1.55	"	1.95
Dutch Blue Cottons.	2.25	"	2.50
French Blue Linens..	3.00	"	—
Checks and Blues...	2.00	"	—
Linsey Garments....	1.90	"	2.00
Dark Cottons.....	1.50	"	1.60
Old Shopperies.....	1.30	"	1.45
New Shopperies.....	1.45	"	1.50
French Blues.....	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.75	@	3.00
Domestic	2.50	"	2.75
Wool Tares, light....	2.00	"	2.25
Wool Tares, heavy..	2.12½	"	2.25
Bright Bagging.....	2.25	"	2.50
Manila Rope—			
Foreign	4.25	"	4.50
Domestic	3.75	"	4.00
Jute Threads.....	2.62½	"	2.75
Sisal Strings.....	2.10	"	2.35
Mixed Strings.....	1.10	"	1.30

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.10	@	3.25
Ordinary Hard White No. 1....	2.25	@	2.50
Soft White No. 1...	1.80	"	1.90
Soft White Extra..	2.50	"	2.60
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag....	1.00	"	1.10
Solid Flat Book...	1.25	"	1.30
Crumbled No. 1...	.70	"	.75
Ledger White Stock.	2.15	"	2.25
Ledger Stock Colored	1.65	"	1.70
Manila—			
New Env. Cut....	1.70	"	1.80
New Cuttings.....	1.30	"	1.40
Old Kraft Machine Compressed bales..	1.75	"	1.85
News—			
No. 1 White News	1.75	"	1.90
Strictly Overissue.	.70	"	.75
Strictly Folded....	.60	"	.65
Corrugated	.72	"	.77½
No. 1 Mixed Paper..	.47½	"	.52½

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.19½	@	—
White Hemp.....	.19½	"	—
Fine Polished—			
Fine India.....	.24	"	—
Unpolished—			
Box	.15	"	—
Paper Makers.....	.15¾	"	—
Tube Rope.....	.17	"	—
Wall Paper.....	.16	"	—
Wrapping	.18¾	"	—
Soft Fiber Rope...	.16¾	"	—
Cotton	.21½	"	—

(Hard Fiber)

Medium Java.....	.20	"	—
Mex. Sisal.....	.17	"	—
Manila	.24¾	"	—

Domestic	2.25	"	2.50
Sisal Rope.....	2.25	"	2.50
Mixed Rope.....	.85	"	1.00
Transmission Rope—			
Foreign	3.50	"	3.75
Domestic	2.50	"	3.00
Soft Jute Rope.....	3.00	"	3.25
Manila Rope—			
Foreign	4.85	"	5.10
Jute Carpet Threads.	1.50	"	1.75
Gunny Bagging—			
Foreign	2.75	"	2.85
Domestic	2.25	"	2.50
Bleachery Burlap....	4.00	"	3.25
Scrap Burlap—			
Foreign	2.25	"	2.40
Domestic	2.50	"	—
Scrap Sisal.....	2.25	"	2.50
Scrap Sisal for Shredding	2.30	"	2.65
Wool Tares, Heavy..	2.40	"	2.50
New Burlap Cuttings	3.75	"	4.00
Aust. Wool Pouches.	3.00	"	3.25
Heavy baling bagging	2.60	"	2.90
Paper Mill Bagging..	1.75	"	2.00
No. 2 Bagging.....	.75	"	.80

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints.	—	@	.03
Fancy Percales....	.04	"	.04¼
New White No. 1.	—	"	.07½
New Light Flannelettes	.05	"	.05¼
Silesias No. 1	.05	"	—
New Black Silesias..	3.20	"	3.25
Soft Unbleached...	.07	"	.07½
Blue Cheviots.....	.05	"	.05½
Fancy	.02	"	.02½
Washable	.02	"	.02½
Cottons—According to Grades—			
Blue Overalls.....	.04¾	"	.05
New Black, Soft..	.03	"	.03¼
Khaki Cuttings.....	.03	"	—
O. D. Khaki.....	.03	"	.03½
Corduroy	.02¾	"	.03
New Canvas.....	.06¾	"	.07¼
B. V. D. Cuttings...	.07	"	.07½

Domestic Rags (Old)

(F. o.b. Boston)

White No. 1—			
Repacked	2.75	"	3.75
Miscellaneous	2.40	"	2.60
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00	"	2.25
Twos and Blues.....	1.50	"	2.00
Old Blue Overalls ..	1.60	"	2.00
Thirds and Blues—			
Repacked	—	"	1.25
Miscellaneous	—	"	1.00
Black Stockings.....	3.50	"	4.00
Roofing Stock—			
No. 1.....	1.00	"	1.25
No. 2.....	—	"	1.10
No. 3.....	—	"	.90

Foreign Rags

(F. o. b. Boston)

Canvas	.04¼	@	—
Dark Cottons.....	(nominal)		
Dutch Blues.....	(nominal)		
New Checks and Blues	(nominal)		
Old Fustians.....	(nominal)		
Old Linsey Garments.	(nominal)		
New Silesias.....	(nominal)		

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f.o.b. Phila.)

Shirt Cuttings—			
New White No. 1.	.07¼	@	.07½
New White No. 2.	.04	"	.04½
Light Silesias.....	—	"	.04½
Silesias, No. 1....	—	"	.04½
Black Silesias, soft	—	"	.03¾
New Unbleached..	.05½	"	.06
Washable, No. 1..	—	"	.04
Blue Overall.....	.04½	"	.05
Cottons—According to grades—			
Washable No. 2....	—	"	.01¾
New Blue	—	"	.01¾
Fancy Percales.....	—	"	.03
New Black Soft...	—	"	.04
New Light Seconds	.04½	"	.05
New Dark Seconds	—	"	1.55
Khaki Cuttings—			
No. 1 O. D.....	.03½	"	.03¾
No. 2 Mixed.....	.02½	"	.02¾
Corduroy	—	"	.03
New Canvas.....	.05¾	"	.06
New Black Mixed.	—	"	.03

Domestic Rags (Old)

White No. 1—			
Repacked	3.25	@	3.75
Miscellaneous	2.50	"	2.75
Thirds and Blues—			
Miscellaneous	1.55	"	1.65
Repacked	1.75	"	2.00
Black Stockings (Export)	3.50	"	4.00
Roofing Stock—			
Foreign No. 1....Nominal			
Domestic No. 1...	—	"	.90
Domestic No. 2...	—	"	.80
Roofing Bagging..	—	"	.70

Bagging

(f.o.b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.25	@	2.75
Manila Rope.....	—	"	4.50
Sisal Rope.....	1.75	"	2.00
Mixed Rope.....	.75	"	1.00
Scrap—			
No. 1.....	2.50	"	2.75
No. 2.....	1.10	"	1.15
Wool Tares, heavy..	3.50	"	3.70
No. 1 New Light Burlap	3.00	"	3.50
New Burlap Cuttings	2.00	"	2.25

Old Papers

(f.o.b. Phila.)

Shavings—			
No. 1 Hard White	2.50	@	2.55
No. 2 Hard White	2.10	"	2.15
No. 1 Soft White	2.00	"	2.10
No. 2 Soft White	1.60	"	1.75
No. 1 Mixed.....	.90	"	1.00
Solid Ledger Stock..	1.75	"	1.80
Ledger Stock, white.	1.90	"	2.00
Ledger Stock, colored	1.40	"	1.45
No. 1 Books, heavy..	1.10	"	1.15
Manila Cuttings.....	1.90	"	1.95
Print Manila.....	.65	"	.70
Container Manila....	.55	"	.60
Kraft Paper.....	1.70	"	1.75
No. 1 Mixed Paper...	.40	"	.45
Straw Board Chip...	.40	"	.45
Binders Board Chip..	.40	"	.45
Corrugated Board....	.70	"	.75
Overissue News.....	.75	"	.80
Old Newspapers.....	.55	"	.60

BOSTON

Old Papers

(f.o.b. Boston)

Shavings—			
No. 1 Hard White	2.75	@	3.15
No. 1 Soft White	2.00	"	2.25
No. 2 Mixed.....	.75	"	.80
Solid Ledger Books..	1.50	"	1.75
Overissue Ledger Stock	1.75	"	2.00
Mixed Ledgers.....	.85	"	.90
No. 1 Books, heavy..	1.00	"	1.10
No. 1 Books, light..	.65	"	.75
Crumpled Stitchless Book Stock	.55	"	.65
Manila Env. Cuttings	1.85	"	2.00
Manila Envelope Cuttings extra quality	2.35	"	2.60
White Blank News..	1.40	@	1.50
No. 1 Kraft.....	1.40	@	1.50
Extra No. 1 Kraft...	1.60	"	1.90
Mixed Papers.....	.45	"	.50
Print Manila.....	.50	"	.55
Container Manila...	.60	"	.70
Old Newspapers.....	.50	"	.55
Paper Wool Strings..	.90	"	1.10
Overissue News.....	1.00	"	1.10
Box Board Chips....	.40	"	.45
Corrugated Boxes...	.50	"	.65
Kraft corrugated boxes	1.20	"	1.40
New Kraft Cuttings.	2.00	"	2.25
Screening Wrappers	.60	"	.70

Bagging

(f.o.b.Boston)

Gunny Bagging—			
Foreign .....(nominal)			

CHICAGO

Waste Paper

(f.o.b. Chicago)

Shavings—			
No. 1 White Envelope cuttings..	3.00	@	—
No. 1 Hard White	2.35	"	2.50
No. 1 Soft White.	1.85	"	1.95
Ledger and Writings	.85	"	.95
Solid Books.....	.95	"	1.05
Blanks	1.50	"	1.60
Kraffts	1.15	"	1.35
New Kraft Cuts.....	1.40	"	1.55
Overissue News.....	.90	"	1.10
Old Newspapers—			
No. 1 Folded News	.65	"	.75
No. 1 Mixed Paper	.40	"	.55
Roofing Stocks—			
No. 1.....	.95	@	1.00
No. 2.....	.85	"	.90

Bacteriological Control Plans

E. W. Tinken, secretary, states one phase of the program which the Biological Control Committee of the American Paper and Pulp Association is supervising this year includes a series of mill surveys. The purpose of these surveys is to extend the collection of scientific data, and, through study of varied conditions and environments, to shed further light on the subject of bacteriological methods and control.

While there has been considerable discussion of the sanitary properties of paper used for packaging wet and dry foods, the committee is convinced that there is much to learn about the subject. Good scientific information and research are required. Part of this can be accomplished in the laboratory, while other aspects, particularly the effect of production variables, must be approached by actual commercial studies. The Institute of Paper Chemistry is working on the entire program and has arranged its personnel to handle the surveys as well as the laboratory investigation.

It should be emphasized, Mr. Tinken states, that the surveys are not concerned with specifications, nor are they "inspection tours." The purpose is to gather, on a confidential basis, significant technical data for the benefit of the mill in question and to augment the general information in the field.

If your company would be interested in participating in the surveys, the secretary states that the association will be glad to inform you more fully of the program and its objectives.

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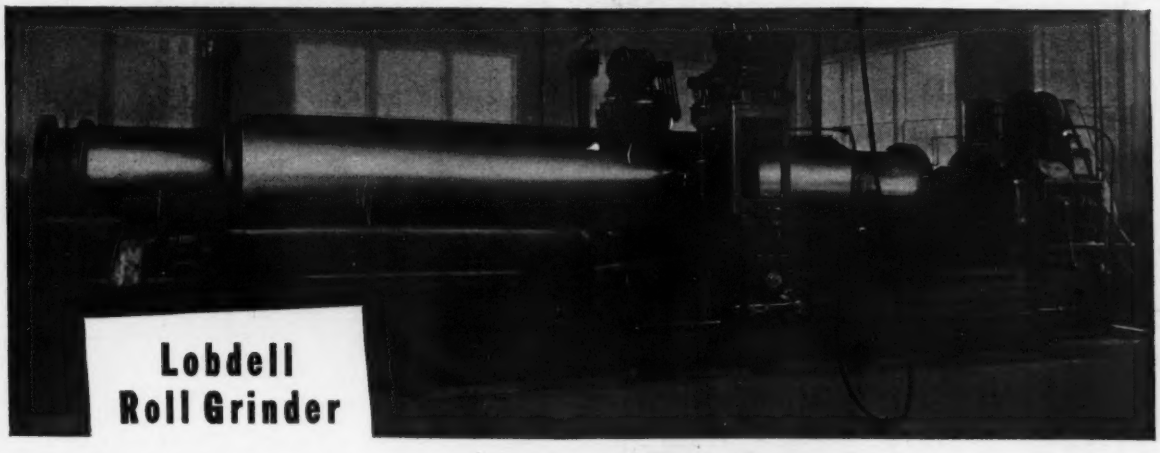

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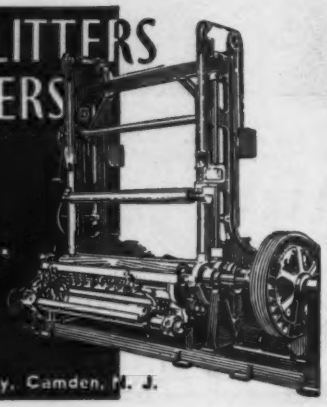

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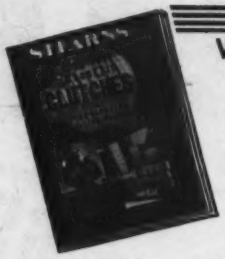

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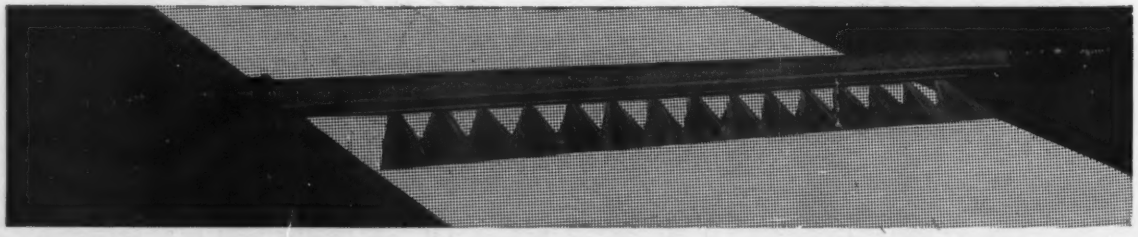

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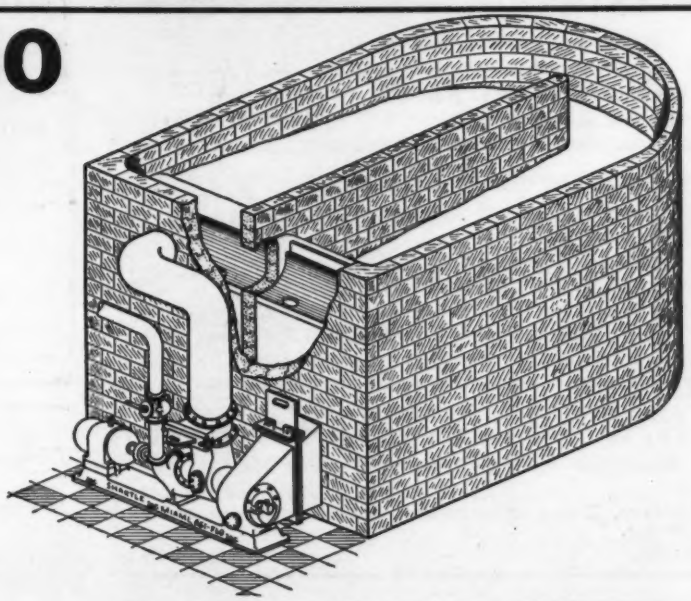

Illustration courtesy of Shartle Brothers Machine Company, manufacturers of the Shartle Agi-flo Pump.

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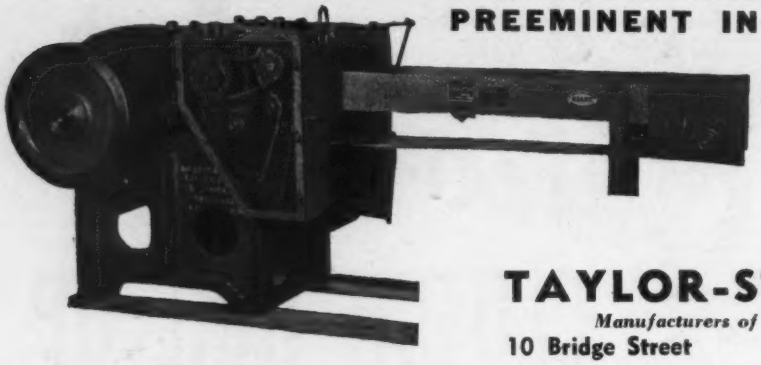

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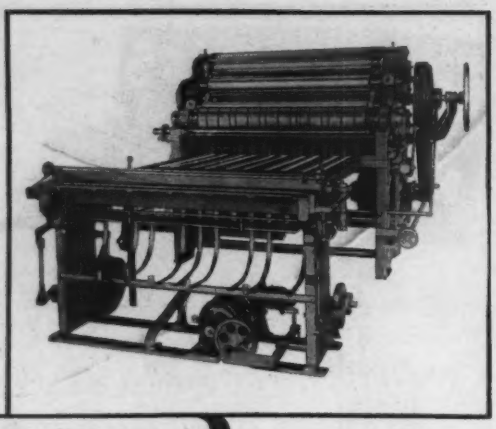

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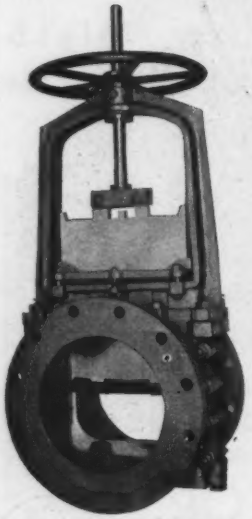

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Montague Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Nekoosa Fdy. & Mch. Wks., Inc.
Oliver United Filters, Inc.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works

DECKLE STRAPS
Shartle Brothers Machine Co.
Stowe-Woodward, Inc.

DEFOAMERS
American Cyanamid & Chemical Corp.
Heller & Merz

DIE CUTTERS
Appleton Machine Co., The

DIGESTERS
Pusey & Jones Corp.

DIGESTER CONTROLS
The Foxboro Company
Mason-Neilan Regulator Co.
Taylor Instrument Companies

DIGESTER FITTINGS
Murray, D. J., Mfg. Co.
Nekoosa Fdy. & Mch. Wks., Inc.

DOCK CONSTRUCTION
Merritt-Chapman & Scott Corp.

DOCTORS
Beloit Iron Works
Bird Machine Company
Black-Clawson Company
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Lobdell Carwheel Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works

DOCTOR BLADES
Cincinnati Rubber Mfg. Co.
International Nickel Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Stowe-Woodward, Inc.

DOCTOR BLADES (Bronze For)
Black-Clawson Company
The Sandy Hill Iron & Brass Works
Shartle Machine Co.

DRAINAGE SYSTEMS
Armstrong Machine Works
Crane Company
Midwest-Fulton Machine Co.
Shartle Bros. Mch. Co.

DREDGING
Merritt-Chapman & Scott Corp.

DRIERS
Beloit Iron Works
Black-Clawson Company
Davis, Frank H., Co.
Link Belt Co.
Murray Mfg. Co., D. J.
Ross, J. O. Engineering Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron, John, Corp.

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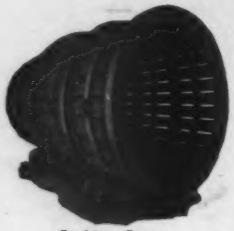
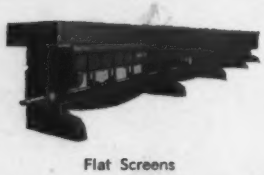


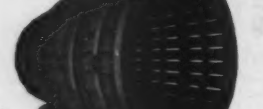
Barking Drums



Flat Screens

Pulpwood Chippers

Double or Single Head Wood Cleaners



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WHERE TO BUY

DRIVES & DRIVE STANDS
Beloit Iron Works
Bird Machine Co.
Black-Clawson Company
Chain Belt Company
Davis, Frank H., Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
General Electric Company
Improved Paper Machy. Corp.
Link-Belt Co.
Montague Machine Co.
Moline Malleable Iron Co.
Moore & White Co.
Murray, D. J. Mfg. Co.
The Noble & Wood Machine Co.
Pusey Jones Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works

DRUMS (Magnetic)
Stearns Magnetic Mfg. Co.
Waldron Corporation, The

DUAL PRESS (Horizontal)
Beloit Iron Works

DUSTERS
Appleton Machine Co.
Downingtown Mfg. Co.
E. D. Jones & Son Co.
Moore & White Co.
The Noble & Wood Machine Co.
D. J. Murray Mfg. Co.

DYESTUFFS & COLORS
Ciba Company
E. I. du Pont de Nemours & Co.
Geigy Co., The
General Dyestuff Corp.
Heller & Merz
National Aniline & Chemical
N. Y. Color & Chemical Co.
Paper Makers Chemical Division, Hercules Powder Co.
Reichhold Chemicals, Inc.
C. K. Williams & Co.

ELECTRIC EQUIPMENT
General Electric Co.

ELEVATORS (Portable)
Link Belt Company

EMBOSSING MACHINES
Paper Converting Machine Co.
John Waldron Corp.

EMBOSSING ROLLS
The Appleton Machine Co.
B. F. Perkins & Son, Inc.
Roehlen Engraving Works Inc.
Waldron Corporation, John

EMULSIONS, RESIN
Pyroxylin Products, Inc.
Reichhold Chemicals, Inc.

ENGINEERS
Ferguson, Hardy S.
Hardy, George F.
Johnson & Wierk, Inc.
Merritt-Chapman & Scott Corp.
Main, Inc., Chas. T.
O'Donaghue, Roderick
J. E. Sirrine & Co.
Stone & Webster Engrg. Corp.

ENGINEERING CONSTRUCTION
Merritt-Chapman & Scott Corp.
Stone & Webster Eng. Corp

EVAPORATORS
Murray, D. J., Mfg. Co.

EXTRACTORS
Bird Machine Company
Downingtown Manufacturing
E. D. Jones & Sons Co.
Midwest-Fulton Machine Co.
The Noble & Wood Machine Co.
Valley Iron Works Co.

FANS
General Electric Co.
B. F. Perkins & Son, Inc.
Ross Engineering Co., J. O.

FAN CONTROLS (Ventilating)
The Bristol Company
The Foxboro Company
Mason-Neilan Regulator Co.
Taylor Instrument Companies

FELT CARRIER ROLLS
American Wringer Co.
Appleton Machine Co.
Beloit Iron Works
Black-Clawson Company
Cincinnati Rubber Mfg. Co.
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Rodney Hunt Machine Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Stowe-Woodward, Inc.
Valley Iron Works

FELT CLEANERS
Philadelphia Quartz Co.

FELT CONDITIONERS
Bird Machine Company
The Noble & Wood Machine Co.

FELTS
Appleton Woolen Mills
Asten-Hill Mfg. Co.
Draper Bros. Co.
Huyck & Son, F. C.
Knox Woolen Co.
Lockport Felt Co.
Mt. Vernon-Woodbury Mills Inc.
Orr Felt & Blanket Co.
Shuler & Benninghofen
Turner Halsey & Co.
Waterbury Felt Co.
H. Waterbury & Sons Co.

FELT GUIDES
Beloit Iron Works
Improved Paper Machy. Corp.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
John Waldron Corp.

FELT TIGHTENER (Automatic)
John Waldron Corp.

FERRULES
Chase Brass & Copper Co.

FILTERS
Moore & White Co.
Improved Paper Machy. Corp.
Oliver United Filters, Inc.
J. O. Ross Engrg. Corp.

FILTER WIRES
International Nickel Co.

FITTINGS PIPE (Plain end or flanged)
Crane Co.
Nekoosa Fdy. & Mch. Wks., Inc.

FLEXIBLE SLICE
E. D. Jones & Sons Co.
The Sandy Hill Iron & Brass Works

FLOORING
Hendrick Mfg. Co.
Norton Co.

FLOW METERS
Bristol Co., The
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Taylor Instrument Companies

FLY BARS
Black-Clawson Company
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Jones & Sons Co., E. D
Midwest-Fulton Machine Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.

FOLDING AND INTERFOLDING MACHINES
Hamblet Machine Co.
Paper Converting Machine Co., Inc.
Waldron, John, Corp.

FORMING MACHINES
Downingtown Mfg. Co.
The Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

FOURDRINIER MACHINES
Beloit Iron Works
Black-Clawson Company
Consolidated Products Co., Inc.
Davis, Frank H., Co.
Downingtown Mfg. Co.
Moore & White Co.
Pusey & Jones
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester

FREENESS RECORDERS
Trimbey Machine Works

FREQUENCY RECORDERS
The Bristol Company
Leeds & Northrup Company
Taylor Instrument Companies

FURNACE PRESSURE (Draft Control)
The Bristol Company
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.

GALVANOMETERS
Foxboro Company
General Electric Co.
Leeds & Northrup Company

WHERE TO BUY

GAS ANALYSIS EQUIPMENT SO_2 and CO_2 RECORDERS
Leeds & Northrup Company

GATES (Canal & Sluice)
Crane Company
Rodney Hunt Machine Co.

GEARS
Beloit Iron Works
Black-Clawson Company
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
E. D. Jones & Son Co.
Link-Belt Co.
Midwest-Fulton Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
John Waldron Corp.

GENERATORS
De Laval Steam Turbine Co.
General Electric Co.

GENERAL CONTRACTORS
Merritt-Chapman & Scott Corp.
Stone & Webster, Inc.

GLYCERINE
Reichhold Chemicals, Inc.

GRABS & GRAPPLES
Link Belt Company

GRADUATED DRYER TEMPERATURE CONTROL
Armstrong Machine Works

GRANITE ROLLS
Beloit Iron Works
Black-Clawson Company
Montague Machine Co.
The Noble & Wood Machine Co.
Downingtown Mfg. Co.
Perkins & Son, Inc., B. F.

GRINDERS
Covel-Hanchett Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works

GRATING (Sidewalk)
Hendrick Mfg. Co.
Nekoosa Fdy. & Mch. Wks., Inc.
Norton Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

HANGERS
Chain Belt Company
Crane Co.
Link Belt Co.

HEATING AND VENTILATING SYSTEMS
Crane Co.
General Electric Co.
Grinnell Company
D. J. Murray Mfg. Co.
Perfecting Service Corp.
Ross Engineering Corp., J. O.

HEAT-TREATING FURNACES
Leeds & Northrup Company

HIGH DENSITY THICKENERS
Improved Paper Machy. Corp.
Shartle Brothers Machine Co.

HOISTS
Appleton Machine Co.
Harnishfeger Corp.
Rodney Hunt Machine Co.
E. D. Jones & Sons Co.
Link Belt Co.

HOSE (Air, Water, Suction, etc.)
Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Manhattan Rubber Mfg. Co.
The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc.

HUMIDIFIERS (Steam)
Armstrong Machine Works

HUMIDITY RECORDERS
The Bristol Company
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Taylor Instrument Companies

HYDRAULIC MACHINERY
Farrel-Birmingham Co.

INDICATORS AND INSTRUMENTS
N. P. Bowsher
The Bristol Co.
The Foxboro Company
Cambridge Instrument Co.
General Electric Co.
Grinnell Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
National Technical Laboratories
Taylor Instrument Companies

JORDANS
The Appleton Machine Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works

JORDAN FILLINGS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Davis, Frank H., Co.
International Nickel Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works

KNIVES
Beloit Iron Works
Dilts Machine Works, Inc.
Hamblet Machine Co.
Nekoosa Fdy. & Mch. Wks., Inc.
E. D. Jones & Sons Co.
Valley Iron Works

LABELLING MACHINES
Potdevin Machine Co.

LABORATORY EQUIPMENT
Appleton Machine Co.
Dilts Machine Works
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
Leeds & Northrup Company
Perfecting Service Corp.
Mine & Smelter Supply Co.
Noble & Wood Machine Co.
Taylor Instrument Companies
Valley Iron Works

LACQUERS
Pyroxylin Products, Inc.

LAMINATING MACHINES
Paper Converting Mch. Co.

LATHES
Montague Machine Co.

LAY BOYS
Hamblet Machine Co.
Moore & White Co.

LIGHTING EQUIPMENT (Electric)
General Electric Company

LININGS (Stainless Clad Steel)
Ingersoll Steel & Disc Division, Borg-Warner Corp.

LIQUID LEVEL RECORDERS
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Midwest-Fulton Machine Co.
Taylor Instrument Companies

LITHOPONE
Chemical & Pigment Co.

LOAD (Electrical) CONTROL
Leeds & Northrup Company

LOFT DRYERS
Ross Engineering Corp., J. O.
Perfecting Service Corp.
Valley Iron Works
John Waldron Corp.

LUBRICATORS
Hills-McCanna Co.

LUBRICANTS
Gulf Refining Co.
Shell Union Oil Co.
Socony-Vacuum Oil Co., Inc.
Tide Water Associated Oil Co.

MACHINERY ERECTION
Merrit-Chapman & Scott Corp.

MAGNETS (All Kinds)
Stearns Magnetic Mfg. Co.

MARKING BANDS (Rubber)
Cincinnati Rubber Mfg. Co.
Stowe-Woodward, Inc.

METERS
The Bristol Co.
Cambridge Instrument Co.
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
National Technical Laboratories
Taylor Instrument Companies

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CAMDEN, MAINE

WHERE TO BUY

METERING & PROPORTIONING SYSTEMS
The Bristol Company
The Foxboro Company
Mason-Neilan Regulator Co.
Merrick Scale Mfg. Co.
Process Controls, Inc.
Taylor Instrument Companies
Trimbey Machine Works

MICROMETERS
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Montague Machine Co.

MIXERS
Francis, Chas. E., Co.
Link Belt Company
Waldron Corp., John

MOISTURE RECORDER
Cambridge Instrument Company

MONEL METAL (Covered Rolls)
The International Nickel Co.

MONEL METAL (Rolled Forms)
The International Nickel Co.

MOTORS
General Electric Co.

NAPKIN FOLDING MACHINE
Waldron, John, Corp.

NICKEL-CLAD STEEL
The International Nickel Co.

NICKEL IRON ALLOYS
Montague Machine Co.
Nekoosa Fdy. & Mch. Wks., Inc.
The International Nickel Co.

PACKING
Greene, Tweed & Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

PACKING BOXES
Shartle Brothers

PACKING (Specially Treated to Caustic Soda and Alkalies)
Greene, Tweed & Co.

PACKING (Rubber)
Cincinnati Rubber Mfg. Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

PADDLES
Bahr Brothers Mfg. Co.

PAPER MACHINE DRIER CONTROL SYSTEMS
Armstrong Machine Works
The Bristol Company
The Foxboro Company
Mason-Neilan Regulator Co.
Midwest-Fulton Machine Co.
Perfecting Service Corp.
Taylor Instrument Companies

PAPER MANUFACTURERS
West Virginia Pulp & Paper

PAPER MACHINE HOODS
Ross Engineering Corp., J. O.
Perfecting Service Corp.

PAPER MACHINE SLICES
Beloit Iron Works
Black-Clawson Company
E. D. Jones & Sons Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

PAPER ROLLS
B. F. Perkins & Son, Inc.
Waldron Corp., John

PAPER TESTERS
Perkins & Son, Inc., B. F.
Valley Iron Works

PAPER TUBE MACHINERY
Dietz Machine Works
Langston Co., Samuel M.

PASTES, SHEET
Francis, Chas. E., Co.

PASTING MACHINES
Beloit Iron Works
Black-Clawson Company
Davis, Frank H., Co.
Francis, Charles E., Co.
Murray, D. J., Mfg. Co.
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
John Waldron Corp

PENSTOCKS
Rodney Hunt Machine Co.

PERFORATING MACHINES
Dietz Machine Works
Waldron John, Corp.

PERFORATED METAL
Chase Brass & Copper Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.

pH TESTERS AND CONTROL
Cambridge Instrument Co.
Leeds & Northrup Company
National Technical Laboratories
Wallace & Tiernan, Co., Inc.
Wilkens-Anderson Co.

PILLOW BLOCKS
Link Belt Company
Chain Belt Company
Nekoosa Fdy. & Mch. Wks., Inc.

PIPE
The American Rolling Mill Co.
Chase Brass & Copper Co.
Crane Co.
Grinnell Company
Nekoosa Fdy. & Mch. Wks., Inc.
The International Nickel Co.

PIPING CONTRACTORS
Merritt-Chapman & Scott Corp.

PITCH CONTROL
American Colloid Company

PLATING, CHROMIUM
Chromium Corp. of America

PLATERS
Perkins & Son, Inc., B. F.

PLATES
The American Rolling Mill Co.
Ingersoll Steel & Disc Division, Borg-Warner Corp.

PLUGS
Black-Clawson Company
E. D. Jones & Sons Co.
The Noble & Wood Machine Co.
Shartle Brothers Machine Co.

POLES
Bahr Brothers Mfg. Co.

POTS, GLUE
Francis, Chas. E., Co.

POTENTIOMETERS
The Foxboro Company
Leeds & Northrup Company

POWER PLANTS
Johnson & Wierk, Inc.
Roderick O'Donoghue
Perfecting Service Corp.

PRESSES
Beloit Iron Works
Black-Clawson Company
Farrel-Birmingham Co.
Francis, Chas. E., Co. (Hydraulic, Screw)
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Shartle Brothers
Valley Iron Works
Waldron Corp., John

PRESS ROLLS
American Wringer Co., Inc.
Beloit Iron Works
Black-Clawson Company
Cincinnati Rubber Mfg. Co.
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
Perkins & Son, Inc., B. F.
Pusey & Jones Corp.
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers
Stowe-Woodward, Inc.

PRESSURE BULKERS
Perkins & Son, Inc., B. F.

PRINTING PRESSES
H. H. Heinrich, Inc.
Potdevin Machine Co.
Paper Converting Machine Co., Inc.
John Waldron Corp.
Weber, Herman G.

PULLEYS (Magnetic)
Stearns Magnetic Mfg. Co.

PULP BINDERS
Reichhold Chemicals, Inc.

WHERE TO BUY

PULP MILL MACHINERY
Bauer Brothers Co.
Improved Paper Machy. Corp.
Montague Machine Co.
Nekoosa Fdy. & Mch. Wks., Inc.

PULPSTONES
Norton Co.

PULPS
Anderson Co., J.
Bulkley Dunton Pulp Co., Inc.
Gottesman & Co., Inc.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp Sales Corporation
Pulp and Paper Trading Co.

PULPERS
Bauer Brothers Co.
Bird Machine Co.
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

PULLEYS
Beloit Iron Works
Black-Clawson Company
Chain Belt Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Horton Mfg. Co.
Link-Belt Co.
Montague Machine Co.
Nekoosa Fdy. & Mch. Wks., Inc
The Noble & Wood Machine Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works

PULPWOOD STACKERS
Link Belt Co.

PUMP PRIMERS (Steam and Water Jet)
Valley Iron Works Co.

PUMP VALVE BALLS (Rubber)
Stowe-Woodward, Inc.

PUMPS
Beloit Iron Works
Black-Clawson Company
Davis, Frank H., Co.
Dorr Company
Downingtown Mfg. Co.
Frederick Iron and Steel Co.
De Laval Steam Turbine Co.
Hills-McCanna Co.
Midwest-Fulton Machine Co.
Moore & White Co.
Morris Machine Works, Inc.
Nash Engineering Co.
Nekoosa Fdy. & Mch Wks., Inc.
The Noble & Wood Machine Co.
Oliver United Filters, Inc.
Paper Converting Mch. Co.
Robbins & Myers, Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
Warren Steam Pump Co.

PYROMETERS (Roll)
The Bristol Co.
Cambridge Instrument Co.
Leeds & Northrup Company

RAG CUTTERS
The Noble & Wood Machine Co.
Perkins & Son, Inc., B. F.
Taylor Stiles & Co.

REAM COUNTERS
Hamblet Machine Co.

RECORDING INSTRUMENTS
The Bristol Co.
The Foxboro Company
General Electric Co.
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Taylor Instrument Companies
Trimbey Machine Works

RECOVERY SYSTEMS
Rodney Hunt Machine Co.
Improved Paper Machy. Corp.
Moore & White Co.
D. J. Murray Mfg. Co.
Pusey & Jones
Ross Engineering Corp., J. O.

REELS
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Montague Machine Co.
Moore & White Co.
Paper Converting Mch. Co.
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

REFINERS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Bauer Brothers Co.
The Cannard Company
E. D. Jones & Sons Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co
Shartle Brothers Machine Co.
Valley Iron Works

REFRACTORS
Norton Co.

REGULATORS
The Bristol Co.
The Foxboro Company
General Electric Co.
Leeds & Northrup Company
Link Belt Company
Mason-Neilan Regulator Co.
The Noble & Wood Machine Co.
Taylor Instrument Companies
Trimbey Machine Works

RESINS, SYNTHETIC
American Cyanamid & Chemical Corp.
Pyroxylin Products, Inc.
Reichhold Chemicals, Inc.

ROD MILLS
The Mine and Smelter Supply Co.
Murray, D. J. Mfg. Co.

ROLL HANDLING TRUCKS
Automatic Transportation Co.
Towmotor Company

ROLLS (Brass and Copper)
Black-Clawson Company
Rodney Hunt Machine Co.
Improved Paper Machy. Corp.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

ROLLS (Bronze)
Rodney Hunt Machine Co.
Montague Machine Co.

ROLLS (Chilled Iron & Gray Iron)
Black-Clawson Company
Davis, Frank H., Co.
Farrel-Birmingham Co.
Improved Paper Machy. Corp.
Lobdell Car Wheel Co.
Montague Machine Co.
Shartle Brothers Machine Co.
The Sandy Hill Iron & Brass Works
Smith & Winchester Mfg. Co.
Valley Iron Works

ROLLS (Magnetic)
Stearns Magnetic Mfg. Co.

ROLLS (Rubber or Rubber Covered)
American Wringer Co.
Beloit Iron Works
Black-Clawson Company
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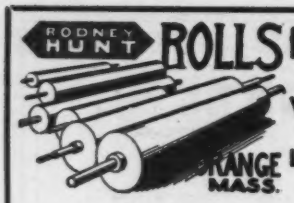

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